TENTH

ANNUAL REPORT

OF THE

PRESIDENT AND DIRECTORS

TO THE

STOCKHOLDERS

OF THE

BALTIMORE AND OHIO

RAIL ROAD COMPANY.

BALTIMORE:

PRINTED BY JAS. LUCAS AND E. K. DEAVER.

1836.

TABULAR STATEMENT, *exhibiting in detail, the operations and various actual expenses of working the* "MAIN STEM" *of the Baltimore and Ohio Rail Road, during the year ending September 30th* 1845,—*and the amount of receipts for Transportation of Passengers, Tonnage, Mails, &c., during the same period.*

HEADS OF EXPENDITURE.	Miles run by Locomotives. With Passenger Trains.	With Tonnage & company's materials.	Total.	Number of Passengers carried one mile.	Cost per Passenger per mile.	Cost of conveying Passengers.	Number of Tons carried one mile.	Cost per Ton per mile.	Cost of transporting Tonnage.	Aggregate cost of working the Road.
MOTIVE POWER by Steam,—including actual cost of repairs and renewals of Locomotives and Tenders, ($40,312 68)—Fuel, (6,811½ cords of wood and 5,437 8-10 tons of coal, including cost of preparation for Engines, $29,464 77)—Oil for Locomotives and Tenders, (6,849 gallons, $6,061 36)—Cotton Waste, (6,807 pounds $330 78—and Wages of Enginemen and Firemen (21,072 78,)	150,572	408,146	558,718	9,155,325	0.295	$27,015 32	11,157,931	0.656	$73,227 05	$100,242 37
MOTIVE POWER by horses,—in the streets of Baltimore, . .				112,595		*6,693 69	119,522		*11,136 64	17,830 33
TOTALS AND AVERAGES OF MOTIVE POWER, ...				9,267,920	0.363	33,709 01	11,277,453	0.748	84,363 69	118,072 70
REPAIRS OF RAILWAY, less cost of repairing breaches ($313 49) and including decrease in value of stock for repairs, ($706 15)					0.258	23,871 65		0.574	64,705 88	88,577 53
REPAIRS AND RENEWALS OF BRIDGES, less cost of improvements and increase of stock for repairs, the first being $14,802 11, and the latter, $3,643 49					0 108	9,990 54		0.240	27,080 10	37,070 64
REPAIRS OF DEPOTS, ...					0.020	1,865 33		0.045	5,056 09	6,921 42
" WATER STATIONS, less increase of stock for repairs, $500					0.003	276 50		0 007	749 44	1,025 94
PUMPING WATER, ...					0 007	621 20		0 015	1,683 80	2,305 00
WATCHING BRIDGES, ...					0.020	1,800 13		0.043	4,879 37	6,679 50
REPAIRS AND RENEWALS OF CARS, corrected for difference in value of materials for repairs on hand at the commencement and close of the year, and embracing $1,970 94 for repairs of coal cars, which item was included in that of "Coal Trade," in the Secretary's statement					0.119	11,020 36		0.241	27,227 75	38,248 11
TRANSPORTATION DEPARTMENT, embracing salaries of Superintendent, Agents and Clerks, ($9,071 21,)—Conductors and Brakemen of Passenger Trains, ($4,667 59,)—Burden Trains, (7,522 85,)—Labor at Depots, (5,387 85,)—Oil and Grease for Cars, (3,157 22,)—and Contingencies, (5,719 12.) . . .					0.118	10,956 49		0.218	24,569 35	35,525 84
GENERAL EXPENSES, which embrace salaries of President, Secretary, and Clerks in Secretary's Office, Office Rent, Counsel's Fees, Taxes, Insurance on Property, &c., &c., &c.					0.025	2,375 91		0.057	6,440 08	8,815 99
	150,572	408,146	558,718	9,267,920	1 041	$96,487 12	11,277,453	2.188	$246,755 55	$343,242 67

RECEIPTS AND EXPENSES.

Received for the Conveyance of Passengers, - - - - - - - - - -		$292,011 55
" " Transportation of Tonnage, - - - - - - - - - - -		350,308 11
" " " of U. S. Mail, - - - - - - - - - - -		43,305 00
" " Use of Main Stem to Relay House by Passengers Washington Branch, -		33,128 93
" " " " " " Tonnage, " " - -		15,188 29
" " Tolls upon Harper's Ferry Viaduct, - - - - - - - -		1,436 82
" " Use of Cars on Winchester and Potomac Rail Road, - - - - - -		3,224 48
Total Receipts,		$738,603 18
Expended for the Conveyance of Passengers and Mails, - - - - -	$96,487 12	
" " Transportation of Tonnage, - - - - - - -	246,755 55	
		343,242 67
Showing the Nett Revenue to have been, - - - - - - - - -		$395,360 51
To which, in order to shew the same results as exhibited by Statement B, in the 19th Annual Report of the Baltimore and Ohio Rail Road Company:		
Add cost of Repairs of Coal Cars, which, as above stated, was embraced under the head of charges for "*Coal Trade,*" - - - - - - - - - - - - -		1,970 94
And amount of decrease in value of Materials on hand for Repairs of Railway and Burden Cars,		1,067 32
Making together an aggregate value of - - -		$398,398 77
And deduct therefrom, extraordinary expenses, as follows, viz:		
Expenditures within the year, for repairs of Breaches in the Road by freshets, west of Harper's Ferry, - - - - - - - - - - - - -	$313, 49	
For permanent improvements in Bridges, and increase in stock of Materials, for for their repair, - - - - - - - - - - - - -	$18,445 60	
For increase in the stock of Materials for Repairs of Water Stations, - -	$500 00	
" " " " " Passenger Cars, - -	$208 91	
" " in duplicate parts of, and permanent Improvements in Locomotives,	$4,169 03	
		23,637 03
Surplus same as in statement B, above referred to, - - - - - - -		$374,761 74

REMARKS.

Besides the Tonnage transported as above, and for which the Company have received pay, there have been hauled of Materials for Repairs of Railway and Bridges, and of Fuel for Locomotives, &c., equivalent to 762,224 Tons one mile; which amount, if added to the 11,157,931 Tons hauled one mile by Locomotives as above stated, and their sum divided by the number of miles run by Locomotives with Tonnage Trains, will shew the average net load of each Engine to have been 29 2-10 tons, which is 7 53-100 tons greater than the average of the previous year.

There have been carried over the Winchester and Potomac Rail Road, in the Cars of this Company, equivalent to 507,420 Tons one mile.

The average number of Passengers in each train has been 61.

" " charge for the transportation of Tonnage 3.106 cents per mile.

" " " " conveyance of Passengers, 3.151 " "

" " cost for Repairs and Renewals of Locomotives, 7.215 cents per mile, run with Trains.

The average charge for Transportation, exclusive of Coal, 3.488 cents per mile, run with Trains.

The average cost of running the Trains, exclusive of Horse Power in the streets of Baltimore, has been 58 2-10 cents per mile.

The average cost of running the Trains, inclusive of Horse Power in the streets of Baltimore, has been 61 3-10 cents per mile, nearly.

The expenditures common to both Passenger and Burden traffic, have been divided in the proportion of the number of miles run by Locomotives, with the Trains of each description; the greater speed of the Passenger Trains being considered as fully, if not more than equivalent, to the somewhat greater average weight of the Tonnage Trains.

JAMES MURRAY,
Engineer of Machinery and Repairs.

* These expenditures include the cost of conveying Passengers and Tonnage through the streets of Baltimore, for the Washington Branch road, as well as those of the main stem.

ANNUAL REPORT.

In obedience to the requisitions of the charter, the president and directors propose to lay before the stockholders a statement of the affairs of the Baltimore and Ohio Rail Road Company, for the official year, ending on the 1st of October, 1836.

In the ninth annual report, the board announced the completion of the main stem to Harper's Ferry, and of the branch road to Washington. Since then, the Winchester and Potomac Rail Road, which is virtually a prolongation of the Baltimore and Ohio Rail Road up the valley of the Shenandoah, has been opened for general use. At present, some delay and difficulty take place in transporting goods and passengers from one road to the other. This, however, will be obviated, when the viaduct across the Potomac is finished. The stone piers of this structure have been completed for some time, and the wood work will be ready for the passage of cars during the present year. The passenger and burden trains of the two companies will then stop, side by side, in the same depot, and the transit from one to the other will be effected promptly and with great convenience.

Surveys are now in progress for the extension of a rail road from Winchester to Staunton, and there is reason to believe that this work will be undertaken. It is of great importance to Baltimore, and when completed will furnish a continuous rail road of two hundred and fifteen miles in length, from this city into the heart of Virginia.

In the last annual report, the results of the reconnoisances of the chief engineer of the route for a rail road from Cumberland westward, were laid before the stockholders; and the general sa-

tisfaction that they afforded, and the sentiment universally expressed, that the time had arrived for the adoption of vigorous measures in the prosecution of the road to the points of its original destination, caused the board, early in the spring, to organize an engineer force, for the purpose of making detailed surveys and examinations between Harper's Ferry and the summit of the Alleghany, with a view of continuing them, afterwards, to Pittsburg and Wheeling. Four brigades, under the charge of competent officers, were accordingly employed, and have since, without interruption, been diligently at work. A continuous line has been surveyed from Harper's Ferry to the top of the dividing ridge between the eastern and western waters; and the engineers are now engaged in making the surveys on either side of the first line, necessary to determine the best route for the location of the road. The rough and mountainous country, over which the surveys have to be carried, and the importance of leaving no practicable route, of the many that present themselves, unexamined, render the labors of the engineers, necessarily, very tedious; and it will be some time yet before the exact route to be adopted, can be ascertained. The board have considered these surveys as one of the most important subjects claiming their attention, and have urged them forward with all diligence; in doing which they have been fully seconded by the officers in charge of them. So far as they have gone, they have been very satisfactory, and fully corroborate the fact, stated in the last annual report, upon the reconnoissance of the chief engineer, "that the mountains between Cumberland and the western waters can be passed, without the use of stationary power, by locomotive engines and their trains." For a full account of surveys, up to the end of the current official year, reference is made to the reports of the chief engineer, and the engineer of location in the appendix A.

In the month of August last, the brigade employed on the Potomac above Harper's Ferry was broken up by the severe illness of nearly every one of its members, owing to the unhealthiness of the region in which they were at work. Protracted indisposition ensued; and it is only recently that the brigade has been reorganized. The country upon the Potomac will not be sufficiently healthy for the brigade to resume its labors there, before the 1st of November. In the mean time, it has been directed to insti-

tute surveys at Parr's spring ridge, with a view to the relocation of the road there, so as to dispense with the inclined planes, that have so long been a source of heavy expense and injurious delay. When originally located, the then state of knowledge, on the subject of rail roads, and their machinery, and the character of the country for a long distance on either side of the point of crossing the ridge, left no alternative but to adopt them. Since then, however, the astonishing developement, that has taken place, of the capacities of locomotive engines, makes it certain that the ridge where the planes occur can be surmounted by a uniform grade, adapted to the economical and efficient use of locomotive power. When this is accomplished, the interests of the stockholders and the public will be mutually and most materially advanced.

At the December session of the Legislature of Maryland, eighteen hundred and thirty-five, the board of directors memorialized that body, praying for aid to complete the road to Pittsburg and Wheeling; and, at the same time, a similar application was made to the Mayor and City Council of Baltimore. The latter, at once, and with great liberality, and responding to the universal sentiment pervading this community, resolved to subscribe three millions of dollars to the capital stock of the company, whenever the existing legal difficulties were removed, which prevented, at that time, the extension of the work in an unbroken line, westward, from Harper's Ferry. The bill before the Legislature, however, for subscribing to the stock of this company, and also in aid of other works of internal improvement in which the state was interested, met with determined and strong opposition; and, at the end of a protracted session, the subject was postponed to an adjourned meeting of the Legislature in May ensuing. In the interval a numerous and highly respectable convention, the interest of which attracted delegates from Pittsburg and Wheeling, was held in Baltimore, and the various subjects connected with the internal improvements of the state were fully discussed. When the Legislature reassembled in May, the subject was again brought before it; and a law was finally passed by a large majority, containing, among other subscriptions, one of three millions of dollars to the capital stock of the Baltimore and Ohio Rail Road Company. This law released the company from the

restrictions, that prevented the extension of the rail road westward from Harper's Ferry, and in so doing, enabled it to comply with the condition annexed to the subscription by the Mayor and City Council. Before the law could take effect, however, it was necessary that it should receive the assent of both the Baltimore and Ohio Rail Road and the Chesapeake and Ohio Canal Companies. The assent of the first was, as the stockholders are already aware, given at the general meeting held on the 18th July last. The assent of the latter was delayed, in consequence of apprehensions entertained by some of its stockholders, that the provisions of the law, in regard to the joint construction of the rail road and canal, along the Potomac, would, if carried into operation, materially impair the permanency and usefulness of the canal. To obviate this difficulty, the stockholders of the rail road company, at their meeting of the 26th July last, authorised the board of directors to enter into stipulations with the canal company, touching the matters in question; and the apprehensions of the canal company being thereby removed, its assent was given to the law, which, in consequence, went into immediate operation. A copy of the stipulation with the canal company, entered into by the board, in conformity with the directions of the stockholders, will be found in the appendix.

The subscription to the stock of this company, authorized by the law of the extra session, was made to depend upon a guarantee being given to pay six *per cent. per annum*, to the State on the amount subscribed by it, at the end of three years from the payment of each of the State's instalments; with the proviso, that should the profits of the road exceed six per cent. the State was to receive no greater dividend in consequence, but the excess was to be divided among the other stockholders. In consideration of the interest, so to be secured to the State, the company was authorised to charge one cent per mile, in addition to its present charge, for each person transported upon the road. At their general meeting on the 18th of July, the stockholders directed the preparation of the guarantee in question, which was accordingly prepared and transmitted, as required by the law, to the treasurer of the western shore. A copy of it will be found in the appendix. The right of the company to make the additional charge is now perfected. Had it been made during the last

official year, the nett revenue of the main stem would have been doubtless much greater than it has been.

Another important provision, contained in the law of the extra session, is that which releases the company from the obligation to erect "a close fence of boards" between the rail road and canal, at the narrow passes from the Point of Rocks to Harper's Ferry, as a condition precedent to the use of steam between the two places; provided the rail road company shall first tender to the canal company the price of a post and rail fence, for the corresponding portions of the river edge of the towing path. The objections to building the board fence were such, that they prevented (and but for the law of the extra session would have continued to prevent) the use of steam above the Point of Rocks, and obliged the rail road company to maintain an expensive horse power to do the transportation thence to the ferry, a distance of twelve miles, which the engines, that crossed the valley of the Monocacy, could have done with but little additional cost. As soon as the commissioners appointed under the act shall have ascertained the cost of the post and rail fence, it will be tendered to the canal company, and the locomotives, that are now obliged to stop at the Point of rocks, will supersede the horse power beyond that place, and continue their route to Harpers' Ferry.

With regard to the other provisions of the law of the extra session, it is not the intention of the board to enter into detail. The act itself was before the stockholders for their acceptance, and they must be sufficiently familiar with its provisions. Those parts of it only, requiring the present action of the stockholders or the board, have been particularly referred to. The board are gratified in being able to announce to the stockholders, that the various conditions precedent to subscription, which it contains, having been complied with, the subscription of the treasurer of the western shore for thirty thousand shares of the capital stock of the company, ($3,000,000) was made on the 23d of September last; and also, that on the 27th of the same month the same amount of stock was subscribed, under the ordinance to that effect, by the Mayor of Baltimore.

Six millions of dollars have thus been added to the effective means of the company for the prosecution of the rail road to the

western waters. What the amount that will be necessary, to finish the work to Pittsburg and Wheeling, may be, it is impossible, at this time, to say, with any approximation to accuracy. Every effort is being made to complete the surveys to ascertain it. Some time must elapse before it is known. Cost what the road may, however, it will be a cheap road to Baltimore; as, restoring to her the trade of which the great works of rival cities have deprived her, it will place her in possession once more, and forever, of all the advantages to be derived from her geographical proximity to the west.

The time limited in the charter for the completion of the main stem within the State of Maryland, extending only to the 4th July, 1838, an act, prolonging the period for five years from that date, was applied for and obtained at the last session of the Legislature.

In the year 1835, the Legislature of Pennsylvania ncorporated a company to construct a canal from the great Pennsylvania Canal, at Columbia, to the Maryland line, along the eastern shore of the Susquehanna. At the following session, this company applied for permission to change the location of the proposed canal, with a view of constructing it on the western side of the river, and prolonging it, under authority from Maryland, to a *terminus* in the neighbourhood of Havre de Grace. The Legislature of Pennsylvania gave the desired permission; but upon condition, that the Baltimore and Ohio Rail Road Company should first assent to the junction, with the main stem of their work, of a rail road from Pennsylvania, entering Maryland on the dividing line between the former State and Washington county, and striking the Baltimore and Ohio Rail Road at or near Hagerstown or Williamsport. To have assented to this, unconditionally, would have put it in the power of the connecting rail road companies of Pennsylvania, by lowering their rates of toll, to abstract the travel and transportation from the Baltimore and Ohio Rail Road, east of the point of junction, diverting it along their respective roads to the rival city of Philadelphia—and so enabling the latter, notwithstanding its greater distance from the western waters, to receive or forward goods as cheaply as could be done at or from Baltimore; thus making a work, constructed with the means of Maryland, enure to the

benefit of the commercial emporium of a rival State, that had contributed nothing to the undertaking. Pledged as the Baltimore and Ohio Rail Road Company now is, to pay to the State six per cent. on its late subscription, it would have been impossible, with any regard to the interests of the stockholders, to reduce the toll, in competition with works, many of which were the property of the State of Pennsylvania, and the policy of all of which would have been to attract the business from the Baltimore and Ohio Rail Road, east of the point of junction, to themselves. With a view of obviating this difficulty, a condition was inserted in the act, that in case of a reduction of the tolls on the Pennsylvania works in connection, mediately or immediately, with the Baltimore and Ohio Rail Road, the tolls on that road, west of the point of junction, might be increased in proportion; so as to keep the charges on persons, goods or produce, going to or coming from Pennsylvania, uniform throughout the distance they were to be transported; thus putting it in the power of the Baltimore and Ohio Rail Road Company to countervail, at all times, the effects of a reduction of tolls on the Pennsylvania roads in connection with their own work. The law of Pennsylvania, with this provision, has been assented to by the board of directors, and has gone into operation. To have refused the assent, would have been illiberal towards Pennsylvania, which had already permitted a connection by Maryland with her works, in the cases of the rail road to York and the canal along the Susquehannah, as well as inconsistent with the spirit of the age, which is to multiply all means of intercommunication, and increase the number of markets accessible to the producer; and it would, besides, have deprived the citizens of Baltimore, deeply interested in the Susquehannah improvement, of what was deemed of great value to them and to the community. The road from Pennsylvania, whose junction with the main stem, is to comply with the provisions of the above law, has not yet been designated.

In several of their preceding reports, the board of directors have adverted to the efforts made by them to perfect a locomotive engine, adapted to the curved character of their road, and capable of using anthracite coal as fuel; and the very satisfactory results obtained have been, from time to time, detailed. The fur-

ther experience of the board fully justifies the steps heretofore taken by them in this particular. There are now eleven first rate locomotive engines in use upon the main stem and Washington branch, all of which have been manufactured at the company's shops; and six more are being built, which, it is expected, will, when the road over Parr's ridge is relocated, and reconstructed without inclined planes, enable the company to dispense entirely with the use of horse-power, except in the city of Baltimore. A very considerable diminution in the cost of working the road will thus be effected.

Since the death of Phineas Davis, mentioned in the last annual report, Messrs. Gillingham and Winans have taken the company's shops, at the Mount Clare depot, and continue there the manufacture of locomotive engines and rail road machinery, commenced by Mr. Davis. Within the last year, the force employed by them has been considerably increased; a circumstance much to the interest of the company, as it furnishes the means of a prompt compliance with the wants of the road, and, when this is extended westward, will insure a supply of locomotive power and the various necessary machinery, as fast as it is wanted. It may be observed here, that the work-shops at the Mount Clare depot are carried on by Messrs. Gillingham and Winans, independent of the company. They are bound by contract to supply the company with locomotive engines, and all other rail road machinery, at a stipulated price, and, at all times, to give precedence to the company's demands for work. They have the use of the ground and buildings occupied by them, with the fixed machinery left by Mr. Davis, without rent, being bound to keep the same in repair, and return them as they received them. In consideration of this, they manufacture the company's engines, so much below the market price for them elsewhere, that the interest on the cost of buildings and fixed machinery, above mentioned, is fully paid; and, indeed, it would take but a little while, when the extension of the road westward required a larger number of engines, to reimburse to the company the entire outlay for the shops at the Mount Clare depot.

Recent experiments, made with the two last engines built by Messrs. Gillingham and Winans, shew a power of traction exerted by them, when the weight of the engine was but eight

tons—much exceeding the greatest power that has yet been exerted on the Liverpool and Manchester Rail Road by a twelve ton engine. When the necessity of having powerful engines to overcome the heavy grades and sharp curves, that must be encountered in the mountain region, is considered, the results here mentioned cannot be too highly appreciated. They make that easy, which, but a few years since, would have been deemed impossible; and the practicability of passing the Alleghanies with locomotive engines and their trains is owing, not more to the topographical advantages of the particular route, than to the powerful machines that have been invented and perfected in the workshops of the company. For particulars of the experiments with the locomotive engines, reference is made to the report of the chief engineer on the subject. Appendix B.

The gross receipts from the main stem during the year ending on the 1st inst. have been $281,966 87, exceeding the gross receipts of the preceding year by $18,598 77. The expenses of transportation during the same period have been $128,177 41, exceeding those of the preceding year by $14,210 23. The repairs of the road for the year just ended have been $53,101 32, while the repairs of the year ending October 1st, 1835, amounted to but $25,103 63, making a difference of $27,997 69. The repairs of machinery and cars have also exceeded the repairs of the preceding year by $9,380.

It will be at once observed, that the expenses of transportation have increased in a much greater proportion than the gross revenue. This is to be accounted for by the extraordinary inclemency of the winter of 1835–36. The frequent falls of snow, lying for a long time upon the ground, alternating with rain, and cold freezing weather, so coated the rails, as to prevent, very frequently, the use of steam for transportation, and made it necessary to employ a number of horses to prevent the business of the road from being interrupted. The snow was often so deep, and the ice on the rails so thick, as to defy the ordinary modes of removing them, and the employment of gangs of labourers became necessary for the purpose.

It is gratifying to the board to be able to state that, while many of the rail roads to the north of the Potomac were either obliged to suspend operations altogether, or were interrupted for days

together, by the inclemency of the season, not a single trip was lost either on the main stem of the Baltimore and Ohio Rail Road, or on the lateral road to Washington.

It will also be observed, that the repairs of the road, which, in the year ending October 1st, 1835, amounted to but $25,103 63, have this year been increased to $53,101 32, which is to be attributed to the decay of the wooden string piece, upon which the iron rail has been laid on a considerable part of the line of the road. This it was expected, when it was adopted, would last from eight to ten years: on the contrary, during the last year, after it had been in use but six years, and some of it not so long, the wooden string piece very generally required replacing. The graduation and masonry of the road continue in good order along the entire line; the repairs, which form so large an item among the charges against the income, occur in the superstructure,—thus corroborating the opinion, which is now generally entertained, that where the means can be obtained with which to procure it, a heavy iron rail is the best and most economical in the end.

The repairs of machinery, engines and cars, have also, as is seen above, considerably exceeded those of the year ending October 1st, 1835. This is owing chiefly to the increased number of locomotive engines now in use upon the road.

On the Washington road, the gross receipts, since it was opened, including a part of the year ending October 1st, 1835, have been $178,333 95, of which the state tax, amounting to $40,564 26, is a part. The expenses of transportation upon this road have been but $26,540 47, or nearly fifteen per cent. of the gross receipts, while the expenses of transportation upon the main stem are forty-five and a half per cent. of the gross receipts. The difference is to be chiefly attributed to the more ample charge allowed for the transportation of passengers on the branch road, and to the fact of steam being employed exclusively as the moving power throughout. When the planes at Parr's ridge are done away with, and horse power on the main stem superseded entirely by steam, the result, with the increased toll authorised by the act of May session, will be in proportion favourable on this road also. The expenses of repairs of the Washington road have been $15,423 17, of which the sum of $10,000 is properly chargeable to construction—having been spent in the

removal of slides and the adjustment of embankments, and forming a part of the cost of construction as justly as the original excavation and graduation of the road bed. The nett earnings of this road, since it was opened, and which constitute a fund for dividends, amount to $88,772 03. Besides the dividend that the main stem is entitled to receive as a stockholder in the Washington branch, it must be borne in mind, that a considerable sum is annually received by the former for the use of that part of the road which is common to both works. The board have little doubt, therefore, that the receipts from the Washington branch will be more than sufficient to meet the interest on the money borrowed by the main stem to construct it; and indeed the increase of travel and transportation between Baltimore and Washington has been such, since this means of intercommunication has been opened, that there is every reason to believe, that the nett profits of the branch, exceeding six per cent. per annum, will become a source of income to the main stem, fully justifying the company in undertaking to construct it.

In the last annual report, the board expressed the belief that they would, thereafter, be enabled to make regular semi-annual dividends among the stockholders. In making this assertion the board believed that they would be borne out by the increasing business of the road. Not only did they anticipate the increase, which past experience had led them to expect, but they were under the impression, that, upon the opening of a continuous rail road communication with Winchester, the additional trade and travel would so add to the income of the company, as to ensure the payment of regular dividends to the stockholders. They were under the impression too, that the receipts from the Washington branch would be sufficient to meet the interest due on the money borrowed by the company to pay for its stock in that work. In these anticipations the board of directors found themselves, when the time for declaring the expected dividend arrived, disappointed. And they have found it necessary, to call for an instalment of five dollars per share on the stock.

On the first of October, 1835, at the date of the last annual report, the receipts of the company for the preceding six months had amounted to $148,541 63. Instead of this amount being received for the ensuing six months, ending on the first of April,

1836, when the dividend should have been made, the receipts were but $121,614 23, making a difference of $23,927 40. Again, the board had no reason to believe, that the general expenses of the company for the six months, ending on the 1st of April, 1836, would exceed the expenses of the six months immediately preceding The expenses of the latter exceeded, however, the expenses of the former period, by $26,320 70, making, in these two items alone, a deficiency, not anticipated on the 1st of October, 1835, of $50,248 10. The causes of this diminution of receipts and increase of expenses have been already stated in a previous part of this report. The board had expected too, that the $30,000, interest due on the money borrowed to make the Washington branch, on the 1st of April, 1836, would have been met by the dividends received from that work. Instead of this, however, it became a charge upon the main stem, making, with the items already enumerated, the sum of $80,248 10, by which the disposable revenue of the company was reduced below what had been anticipated, when the belief that regular dividends could be declared, was expressed in the report of October, 1835. These matters are stated at length, to explain why it was, that, with the confident belief entertained by them at the date of their annual report, the board of directors still found themselves unable to continue the payment of semi-annual dividends.

During the current year, the construction of the Potomac viaduct—additional sidelings and turnouts—right of way and damages—surveys—real estate and construction of depots and water stations—locomotive steam power and machinery have caused expenditures properly chargeable to the capital stock, but which have had to be met, in anticipation of instalments, by the revenue as it accrued. The amount of the capital in the main stem is $3,311,250, while the money actually expended is $3,474,600 08. On the Washington branch, the capital paid in is $1.500,000, and the capital expended, is $1,588,899 61; making on the main stem, an over expenditure of capital of $163,350 08, and on the Washington branch an over expenditure of $88,899 61; in all an over expenditure of capital of $252,249 69. To meet this, the company has borrowed money, and has appropriated the nett revenue of the main stem and also the nett revenue from the Washington branch. To discharge the debt for borrowed money

due, as aforesaid, the instalment above mentioned has been called for. The amount that has been appropriated out of the revenue of the main stem and applied to purposes connected with the construction thereof, and not to general expenses, other than construction, it is proposed, shall be divided by the number of shares of stock in the main stem, and each share credited with its proportion, as so much paid on it. In the Washington branch, where the stock has been paid in full, this means of giving to the stockholders the benefit of the revenue, which has been appropriated to construction, cannot be adopted. A new stock, to the desired amount, may therefore be created, sold, and the proceeds divided among the stockholders. For an amount of the receipts, expenditures and condition of the company, on the 1st instant, reference is made to the accompanying statement C.

Of the ultimate profit of the Baltimore and Ohio Rail Road to the stockholders, the board of directors can only here reiterate the favorable opinion, that they have so often heretofore expressed. To doubt its making a return on the outlay, when it shall be completed to the western waters, is impossible, when the probable travel and transportation upon it then, is considered. There is hardly a rail road in the country, that has been completed, that is not now realizing a handsome return on the cost of its construction: and the chief reason why this is not done by the Baltimore and Ohio Rail Road, is, that it is *not completed.* If it were, at this day, proposed to make a rail road to Fredericktown or Harpers' Ferry—(supposing the Baltimore and Ohio Rail Road to the west not to be projected even,) no one would be willing to undertake such a work through so difficult a region;—for every one would, at once, doubt its affording an interest on its cost. To expect, therefore, that the Baltimore and Ohio Rail Road, which now, is not a road to the west, but a road to Fredericktown and Harpers' Ferry only, should make the dividends declared by the finished rail roads of the country, were vain indeed. The full extent of its profit can only be realized on its completion.

It is to be remarked here also, that when the charter of the Baltimore and Ohio Rail Road was granted, in 1826, by the Legislature of Maryland, it was the first rail road for general purposes that had been projected in the country—and so sanguine of profit were its friends, that the charge for passengers was deemed

ample at three cents per mile, and for merchandize and produce, four cents eastward and six cents westward, making an average as experience shews, of about four and an half cents. Experience has since shewn, that, upon a costly road, through a difficult country, these rates are too low, upon the limited amount of business that has heretofore been done by this company: and there are but few rail roads in the union on which the charges are not higher.* Combined with the low rate of charge, to which this company is limited, may be mentioned those causes of expense—the working of inclined planes, and the maintenance of an expensive horse power to be used in the city—from which other rail road companies, whose stocks give large dividends, are exempt. These matters are mentioned here, by way of shewing the difference between the companies that are often cited as examples of productive institutions, and the Baltimore and Ohio Rail Road Company; and to shew that the cases are by no means parallel. The Portsmouth and Roanoke Rail Road, for instance, is allowed to charge six cents per mile for the transportation of passengers, and eight cents per ton for freight. The Washington branch makes the same charge for passengers—but only four cents for freight—and has to pay a bonus of one-fifth of its receipts from passengers to the State. Were this bonus not paid, and the Portsmouth and Roanoke rates charged, it would be able to declare out of the earnings of last year alone, a dividend of eight and three-fourths per cent to its stockholders—and at the same rates, for the same time, the main stem could have declared a dividend of eight and a half per cent. When this road is finished to the west, there can be no doubt of its productiveness; and even in the mean time, what, with the increase of toll already authorised, the avoidance of the planes at Parr's ridge, it is believed that a return may be made to the stockholders. It is the desire of the board to see the great work finished, that is to unite Baltimore indissolubly with the

* On the Petersburg Rail Road, for persons per mile, 5 cts. for goods pr. ton pr. mile, 10 cts.
Winchester and Potomac, 6 cts. - - - - 7 cts.
Portsmouth and Roanoke, 6 cts. - - - 8 cts.
Boston and Providence, 5 cts. - - - - 10 cts.
Boston and Lowell, 3 1-2 cts. - - - 7 cts.
Mohawk and Hudson, 5 cts. - - - - 8 cts.

west. They believe that the prosperity of Baltimore depends upon it. The liberality of Maryland—the munificence of the city most interested, have contributed nobly to the enterprize; and the board cannot doubt, that when the surveys shall have ascertained, beyond cavil, the expense of construction, any deficit which may exist, will forthwith be furnished.

By order of the Board

J. W. PATTERSON, *President.*

APPENDIX.

SEVENTH ANNUAL REPORT

OF THE

CHIEF ENGINEER OF THE BALTIMORE AND OHIO RAIL ROAD.

(A.)

ENGINEER'S OFFICE, BALTIMORE AND OHIO RAIL ROAD,
Baltimore, October 7, 1836.

TO JOSEPH W. PATTERSON, ESQ.
President Balt. & Ohio Rail Road Company.

The Branch Road to the city of Washington having been opened, and there being yet no extension of the Baltimore and Ohio Rail Road, beyond Harper's Ferry, no further construction upon either road has been made within the past year, with the exception of the viaduct across the Potomac river at Harper's Ferry, now nearly completed, the perfecting both roads by widening them in places, in removing slips where they have occurred, in improving the depots and work shops, and in erecting water stations. The Baltimore and Ohio Road was opened for travel and transit to a point on the Potomac, opposite to Harper's Ferry, on the 1st day of December, 1834, and the road to Washington, on the 25th day of August, 1835, as was mentioned in the last annual report.

The working of these roads has been effected to the present time, without any interruption, except from the ice and snows of an unusually severe winter, and from the washings and slides occasioned by the great quantities of rain that fell in the spring and early part of the summer. Whilst these causes have acted with much severity, and at times to the serious impediment of the transit, causing considerable delay in the arrival of the trains, yet no trip with passengers has been lost. In general, however, the movement of the trains and their arrival have been very steady and uniform, and highly satisfactory. It is not probable that so untoward a winter and spring as these last will soon recur, nor that equal difficulties will be felt on like occasions, inasmuch as the banks will continue to acquire additional slope and solidity. For a detail of the operations upon the road and the repairs, reference must be made to the report of capt. H. W. Fitzhugh, the superintendent.

The construction of machinery during the year, has, with few exceptions, been carried on successfully, and in a manner to insure the most satisfactory results. The passenger coach, upon eight wheels sustains its character for convenience, comfort, and safety, whilst the cast iron wheels upon which it moves, continue to perform their office with the best economy and entire success. In proof of this, it is but proper to state, that upon the coaches of the company having the highest speed, that is, between Baltimore and Washington, not a single wheel has been fractured or rendered useless from wearing since the opening of the road, more than thirteen months since; most of these wheels have run, within this period, about 30,000 miles, yet they do not show sufficient evidence of approaching failure to prevent their completing 50,000 miles; a distance more than double of that heretofore assigned for their performance. The managers of the transit upon other rail roads, have at length yielded to the proofs we have exhibited, and are availing of this kind of wheel, not only in the transit of commodities, but likewise in the swifter movements with passenger trains.

Whilst from the manifest convenience and safety of the coach with eight wheels, a decided preference is awarded to it over that with only four wheels, in the conveyance of passengers with locomotive engines,* it must be acknowledged, that the claim to

* The following paragraphs from the *Baltimore Gazette* of October 5th, and *National Intelligencer* of October 7th, inst. appear to be just and appropriate, and they are, therefore, appended by way of note in confirmation of our opinions in relation to these coaches.

BALTIMORE, October 5.

The account of a most disastrous occurrence on the Columbia rail road necessarily suggests the inquiry, whether it is not practicable to prevent such disasters occurring to passengers in rail road cars? We feel assurred, from our own observation, that by a proper construction of the cars, and a judicious mode of connecting them with the locomotive and with each other, such a dreadful result from a similar cause would never be produced; and, as an evidence that our opinion is well founded, we refer to the well established fact that no personal injury has ever been experienced by any passenger travelling on the rail road between this city and Washington.

Although we have confined the above statement to the rail road between Baltimore and Washington, we might have extended it generally to the Baltimore and Ohio rail road; but we mean to say, that the cars used for passengers on the Washington rail road, and those of a similar construction on the other road, are more peculiarly fitted to secure the passengers from all risk of injury. Their great size and weight render it almost impracticable to throw them off the track even when the locomotive itself is thrown off; and the fact of their having four wheels and two axles to support each end of the car, would prevent any injury to the passengers by the breaking of one wheel or one axle. There are other protections in the mode of connecting the cars with each other and with the locomotive, which are well calculated to increase the security of the passengers.—*Gaz.*

Messrs. Editors:—In the account in your paper of yesterday of the accident on the Columbia rail road, by the breaking of an axle, the question is asked, how is this to be remedied?

Allow me to suggest, as a very efficient method, the plan of the passenger cars on the Washington and Baltimore road. These cars are the best con-

a preference of the *double* over the *single* car in the transit of commodities is not so clearly established. The cost of repairs, will probably not be greater, and it may be somewhat less, in the double than in the single car, at the same time, the weight of the former exceeds that of the latter, having regard to the quantity of freight conveyed; and consequently in a train of eight wheeled cars the gross tonnage exceeds that in a train of four wheeled cars, the tonnage of the commodities conveyed being considered the same in both cases. With the former, therefore, the pressure upon the road is greater, and, should the friction, or resistance be the same with each, on a level, yet, upon ascents, the gravity would give a preponderance unfavorable to the car of eight wheels. It is hoped that a little more experience than has yet been afforded, will allow a determinate comparison to be made between the two kinds of cars in question; and should it result in favor of the car with only four wheels, the preference would be on the side of a vehicle more convenient in cities and at depots, where it would be more easily moved by manual force than the more cumbrous car with eight wheels.

As regards the enlarged wheels and axles, it may be said that very few fractures have occurred in them, and there have been no failures to remark, excepting with some of the journals of the

structed for security to passengers, as well as speed, of any that have yet come under my observation.

Security in this: the cars are on four axles and eight wheels. If an axle or a wheel were to break, the car would still maintain its upright position and place upon the track. Two axles might give way, or the wheels on two axles, if one were a forward or one a hind axle, and the car still keep its place. Also if two wheels on both forward or after axles were to break, provided they were not on the same side, the car would still keep its place. In fact, it would require the singularly coinciding accidents of the two forward or the two after axles to break at the same time, or both wheels on the same side of either the forward or after pair of axles, to throw these cars off the road, or destroy their upright position. They are, therefore, in all human probability, placed beyond the reach of accidents from the breaking of the axles or wheels.

Of speed: these cars are large; adapted to carry about fifty passengers, or as many as are generally put in three of the smaller kind of cars which run on two axles and four wheels. The three cars, then, have to overcome the friction of six axles and twelve wheels, in doing the work of which one of the large cars is capable, and which have to overcome only the friction of four axles and eight wheels. They require, therefore, a less power to move them, or move with a greater speed under the same power.

There are other advantages in the large eight wheel cars. They concentrate in one mass rather less than the weight of three smaller cars. From this concentrated weight, they are not so much under the power of the engine; that is, not so easily thrown about or thrown off by it. Instances have happened on this road, (the Baltimore and Washington,) in which the engine has been thrown off the track without taking the cars with it; the weight of one (as it is generally but one car, that next the engine, which offers the first and principal resistance in such a case) being more than the engine could control. Its fastening broke, and the cars kept their place.

Also, if an axle or a wheel were to break off one of the large cars, it being still maintained upright and on the track by the remaining axles and wheels, the train could move on; certainly until the engine was stopped, and probably, with care and a diminished speed, to the termination of the trip.—*Intel.*

freight cars, from too small a bearing in the box, caused by a change in the form of the chill, but which was remedied as soon as the evil appeared. In the older wheels and axles fractures frequently take place in consequence of their lightness, and partly from the inferior quality of the iron in the axles. As failures occur in these, the heavier and better wheels and axles, adopted from the experience of their utility, are substituted; so that the ratio of the expense of repairs, in this branch of the service, may be expected to decrease.

The manufacture of locomotive engines at the company's shops by the contractors, Gillingham and Winans, has advanced as the wants of the service appeared to require. Certain modifications of the locomotive engine have been made, the effect of which has been its general improvement; and as a part of the history of this machine, it is proper that these changes, together with one about to be effected, should be noted in this place. The passages for the water through the pipes and pump valves have been enlarged *one-third*, by which means the pumping apparatus works better and remains longer in good order. The steam passage from the boiler to the cylinders has been increased in the proportion of 169 to 100, it being now equal to that of a pipe of $3\frac{1}{4}$ inches diameter, instead of $2\frac{1}{2}$ inches as heretofore. At the same time the opening for the admission of the steam into the cylinder has been enlarged from 4 inches long by $1\frac{1}{4}$ inch wide, to 6 inches by $1\frac{1}{8}$ inch, viz: in the proportion of 27 to 20. And it will be seen that the greater length of the opening admits of a correspondingly greater influx and efflux of steam from an equal movement of *the slide* in the two cases, by which means it is obvious that the efficiency of the engine has been increased. Moreover, from a conviction that the quantity of steam generated would justify the change, the diameter of the cylinders has been increased from $12\frac{1}{4}$ to $12\frac{1}{2}$ inches, augmenting the area about $4\frac{1}{8}$ per cent, the length of stroke remaining the same, viz, 22 inches. The opening admitting the waste steam from the cylinders to the fan-wheel has likewise been enlarged, and rendered capable of being contracted to a certain extent at the pleasure of the engine man, by which means he can regulate the blast and generation of steam, and thence control the power and speed as required. Added to these improvements, several parts of the machine have been strengthened, and the whole rendered more pleasing in appearance.

Hitherto the cylinders of this kind of locomotive engine have occupied a vertical position; but a plan has been matured to place and work them horizontally. Two engines with horizontal cylinders, are being built at the company's shops, and it is expected that they will have some advantages over former engines. The horizontal position of the cylinders will allow the boiler to set 10 inches lower than at present, and the centre of gravity of the entire machine will be lowered at least 12 inches,

by which the stability of the engine upon the road will be increased. The boiler will also be enlarged from 52 to 55 inches in external diameter, and the number of tubes will be increased from 400 to 450. It is confidently believed that a more efficient and durable engine will be the result, but as the test of experience will be applied, we may suspend, for the present, all speculation in relation to this scheme.

The method of employing the waste steam in imparting heat to the water previous to the injection of the latter into the boiler, as mentioned on page 24 of the ninth annual report, appears to be attended with success, as it is found to aid in the formation of steam, whilst a saving of fuel to the extent of about 175 lbs. of (anthracite) coal in the journey between Baltimore and Washington has been effected.

In relation to the upright boiler it may be further remarked, that from the circumstance of the ascertained durability of the tubes, which are of malleable iron, none of them having yet failed from the action of the heat, it has been inferred that success would likewise attend the use of copper; accordingly a few tubes of this metal have been substituted for as many of iron in the new engine called the Phineas Davis. This engine has now been running more than sixty days, whilst the copper tubes remain apparently uninjured. Should complete success, as is now expected attend the use of copper tubes, the important advantage of a boiler equally efficient, but of less weight by about 500 pounds, will be gained; added to which, the relative thinness of the metal used, and its power of conducting heat, will render the copper superior to the iron for the tubes of the boilers in question. The reason why the iron tube is necessarily much heavier than the copper one, arises from the thickness of the former metal required to admit of a good weld. Should 400 or 500 pounds weight be saved in the boiler, other parts of the machine may be made heavier and more efficient and durable without adding to the total weight, in which case the engine would evidently be improved.

Locomotive engines, such as have been already described in this and preceding reports, continue to be fabricated in the shops of the Baltimore and Ohio rail road company, by the contractors, Gillingham and Winans, and the performance of these engines has hitherto been highly satisfactory. Few trials of their extreme tractile power have been had since last year; such however, as have been made, together with such as occasionally occur in the business of the road, may be briefly related.

On the twelfth of September last, being the occasion of the anniversary of the battle of North Point, several volunteer companies from this city and the counties adjacent, amounting in all to 900 to 1000 citizen soldiers were conveyed to Washington and back by four locomotive engines, one of which conveyed about 300 troops with their arms and accoutrements. Now

although the full power of the engines were by no means brought into play on this memorable occasion, yet the result had a very impressive effect upon the many thousands who witnessed it, and who were thus furnished with ocular proof of the new and immense facilities created by rail roads and locomotive engines upon them, in the transit of persons and property, and in fact, of whole armies and their accompaniments. The trains here mentioned advanced to Washington in the morning and returned the evening of the same day; and as the return was effected with speed and safety, notwithstanding it was dark, a confirmation was had of the practicability and facility of locomotive travelling by night as well as by day.

It has been usual, recently, (though in the winter season the adhesion will not be sufficient) for a locomotive engine to convey from Baltimore to the foot of the inclined planes at Parr's ridge, six eight-wheeled burthen cars in a train of a gross weight of about 57 tons. The greatest power of traction required in this journey occurs upon ascents of 35 feet per mile, where the road is curved with a radius of 400 feet. Here the gravity to be overcome will be 14 .8 pounds per ton; the friction of these cars (as found on a late trial) was 13 pounds per ton upon a straight road; to which must be added $6\frac{1}{2}$ pounds for curvature of 400 feet radius. The weight of the entire train including engine and tender, is 71 tons.

		lbs.
Then, Friction of cars,	57 tons × 13 =	741
Curvature,	71 tons × $6\frac{1}{2}$ =	461
Gravity of	71 tons × 14 .8 =	1051
Total traction beyond the friction upon a level of the engine and tender, =		lbs. 2253

The report of the committee of the City Council of Baltimore of experiments on the planes at Parr's ridge, made on the 22d day of March last, states that the locomotive engine (the "Andrew Jackson,") of 8 tons 10 cwt. with tender of 4 tons 7 cwt., conveyed up plane No. 1, ascending at the rate of 197 feet per mile, and with a speed of about 5 miles per hour, a train consisting of one double and three single cars, together with 12 tons, 18 cwt. The whole train inclusive of engine and tender being 25 tons 15 cwt., and the distance passed over at this rate of ascent being 2050 feet, added to 100 feet at an ascent of 201 feet per mile.

The gravity opposed to the ascent of 197 feet per mile being 83.75 lbs. per ton, and the friction being assumed at 11 pounds, the calculation of the amount of traction, exclusive of the friction of the engine and tender on a level, will be as follows:

Upon plane No. 1,	lbs.
Friction of 12.9 tons at 11 lbs. per ton, =	142
Gravity of 25.75 tons at 83.75 lbs. per ton, =	2156
Traction,	2298

The engine and train then advanced over the intermediate level and commenced the ascent of plane No. 2, of 3000 feet in length, 2800 feet of which ascending at the rate of 170 feet per mile, and then 100 feet ascending at the rate of 227 feet per mile, were passed over at the rate of from five to six miles per hour; but the train came to a stop upon the next space of 100 feet reaching to the summit, and which ascends at the rate of 264 feet to the mile. The three single cars weighing together 5 tons 1 cwt., were here disengaged, and the engine was then able to commence motion and advance to the level upon the summit: the weight of the train being now 20 tons 14 cwt. Inasmuch as the momentum acquired in the ascent, 170, might have urged the train over the 100 feet of ascent 227, we will, therefore, calculate the traction exerted in passing upon the ascent of 264 feet to the mile.

Upon plane No. 2,	lbs.
Friction of 7.85 tons at 11 lbs. per ton, =	86
Gravity of 20.7 tons at 112 lbs. per ton, =	2318
Traction,	2404

The committee state that the train of 25 tons 15 cwt. could not advance up the ascent of 264 feet to the mile. Here we find a limit to the power of the engine, and calculating the necessary traction required in this case, we find it equal to 3026 pounds, and consequently the engine was not able to exert so great a force of traction as this beyond the friction of itself and the tender. In all this journey the engine worked with the full pressure of the steam through the entire stroke. The very lucid and interesting report of the committee of council from which the foregoing facts have been extracted, is hereto appended in a note.*

*BALTIMORE AND OHIO RAIL ROAD LOCOMOTIVE ENGINES.

CITY COUNCIL—FIRST BRANCH.

Wednesday, March 23, 1836.

Mr. BARNES, from the joint committee appointed to witness experiments upon the powers of the Locomotive Engines, at the inclined planes, submitted the following report :

The joint committee of the City Council of Baltimore, appointed to witness experiments upon the power of the locomotive engines on the Baltimore and Ohio Rail Road, at the inclined planes, respectfully report—That your committee left Baltimore on the morning of Tuesday last, accompanied by a committee of the Board of Directors of the company, a committee of the Board of Trade, and other individuals, in all amounting to forty-two persons. The

Upon the 29th and 30th ult. certain trials were made on the Washington branch road, with the locomotives "Phineas Davis" and "George Clinton," the former having been running about sixty days, and the latter about forty-five days. The cars used were all of the description having eight wheels, and they were loaded so as to average from nine to ten tons each, and were all carefully weighed. The trains after being put in motion upon a level, were made to pass for a distance of about four miles up an ascent at the rate of twenty feet per mile, excepting half a mile at about eighteen feet per mile, curved at two thousand feet radius, and which it was believed offered about an equal resistance to the grade of

train consisted, besides the engine and its tender, of a double eight wheeled passenger car, constructed to accommodate forty-four persons; and three four wheeled passenger cars, capable of containing seventeen each. After some delay, occasioned by coming in contact with the leaders of a burden team, who, being alarmed, sprung before the engine from off the adjoining track, the train arrived at the foot of plane, No. 1, at the distance of forty-two miles from Baltimore. The instructions given to the engineer had been, as your committee are informed, to stop here, and disengaging the double car, to attach the three single cars to the engine, and to ascend the planes with them, and with fifty passengers, this being a demonstration of the power of the engine, which it was believed, would satisfactorily prove its efficiency for use, where the elevation was at the rate of two hundred feet per mile. Confident, however, in the power of the engine, the engineer, without stopping at the foot of the plane, commenced its ascent, with the train that had left Baltimore. The impetus acquired on the level was lost in the first three hundred feet of the ascent, after which, the engine drew its load steadily to the summit of the first plane, at the rate of from four to five miles an hour, accumulating speed as it approached the top. This plane is two thousand one hundred and fifty feet in length—two thousand and fifty feet of which ascend at the rate of one hundred and ninety-seven feet per mile—and one hundred feet at the rate of two hundred and one feet per mile. From the first plane the train proceeded to the second, which is three thousand feet in length—two thousand eight hundred feet of which ascends at the rate of one hundred and seventy feet per mile—one hundred feet at the rate of two hundred and twenty-seven feet per mile, and one hundred feet at the summit, at the rate of two hundred and sixty-four feet per mile. The engine and its train, ascended at the rate of from five to six miles per hour, to within thirty feet of the summit of this plane, when, while on the grade of two hundred and sixty-four feet to the mile, it stopped. The three small cars, weighing five tons one hundred weight, were then cast loose, when the engine starting, without assistance, on this grade, drew the double car and passengers to the summit with the greatest apparent ease. The steam escaped in volumes from the safety-valve as well when the engine reached the summit of the planes as when it left the foot of them. The weight drawn up the planes was as follows, according to actual weighing:

Patterson,	1.	10.	2.	0.
Patapsco,	1.	15.	2.	0.
Carroll,	1.	15.	0.	0.
Double Car,	4.	17.	0.	0.
45 Passengers,	3.	0.	0.	0.
Tender,	4.	7.	0.	0.
Tons,	17.	5.	0.	0.
Engine,	8.	10.	0.	0.
Making a gross weight of	25.	15.	0.	0.

twenty feet to the mile, in a curvature of three thousand eighty-four feet radius, most of the distance being of the latter degree of curvature. The Davis engine drew up the ascent twelve cars weighing gross one hundred and fifteen tons nine hundred weight, but allowing for the weight of the persons upon them, one hundred and sixteen tons, five hundred weight, at the uniform velocity of seven miles per hour. The Clinton engine then drew the same load upon the same ascent, at the uniform rate of six miles per hour. In these trials the engines worked expansively with a cut-off at five-eighths of the stroke. In order, however, to try the effect of the full pressure, the Davis engine was now furnished with cars accordingly, and the ascending road was traversed

This weight of 25 tons and 15 cwt. was drawn up the grades before mentioned, the steepest of which was two hundred and twenty-seven feet per mile with much ease, and by the inherent power of the engine, without the assistance of impetus of previous high speed—and the weight of 20 tons 15 cwt. deducting from the above the weight of the three cars cast off on plane No. 2, was drawn with equal ease up a grade of two hundred and sixty-four feet to the mile; the engine starting the train from rest on this grade. At the summit two car loads of pig iron, weighing each four tons, were attached to the train, and the whole weighing then thirty-three tons and fifteen hundred weight was made to descend the plane, on the return to Baltimore, by the action of the engine alone, and without the assistance of a break, at such speed as the engineer pleased, and was several times stopped, on the way down, to show the command in which the engine was held.

With such results as the above, it is unnecessary to add, that your committee are equally gratified and surprised; and from what they themselves witnessed, they have no hesitation in expressing their conviction, that the engines of the Baltimore and Ohio Rail Road, are capable of drawing, with ease, at least fifty passengers, up ascents of any length, of from two hundred to two hundred and twenty feet per mile.

From the account thus given, it will be at once seen, that the performances of the best engines in England have been far surpassed; and although your committee are aware, that calculation was competent to prove the practicability of ascending grades like those at the planes, with engines of the weight and power used on this occasion, and with similar loads, yet it was reserved for the company in question, to prove that machines of such giant power could be constructed, combining with their great strength, the important qualities of speed, durability, facility of repair, and capability to use anthracite as their fuel.

Your committee are glad to have an opportunity of expressing their sense of the obligations, which the efforts of the Baltimore and Ohio Rail Road Company have conferred upon the rail road system generally, and more especially in reference to it, as connected with the city of Baltimore. It is now a matter of common parlance, to assert, that the Alleghanies can be passed by locomotive engines by the Potomac route, without the use of stationary power; and your committee entertain no doubt of the fact. It is this which gives to Baltimore the vantage ground in the competition with her sister cities, for the western trade; and yet this is owing, not more to the geographical depressions of the mountain range, than to the engines perfected by the company just named. Excepting the engines manufactured by them, there is probably not one in the United States, although some of the best ever made in England have been imported, which is capable of ascending the grades and passing the curves for any profitable purpose, which must occur among the mountains on the road in question. While nature, therefore, has done much to facilitate the intercourse of Baltimore with the west, the Baltimore and Ohio Rail Road Company has not done less.

with a train of thirteen burthen cars and a passenger car, each upon eight wheels, and weighing, exclusive of engine and tender, one hundred and thirty-one tons. This train was not allowed to ascend beyond the straight part of the road, upon which the speed was only at the rate of three miles an hour. The Davis and its tender were now again hitched to the abovementioned train of one hundred and sixteen tons, five hundred weight, which was then drawn four miles up the ascent in twenty-three minutes, forty-five seconds, or at the rate of full ten miles in hour. In this trial as well as in previous ones, the steam constantly escaped from the two safety valves, from which it commences to blow off at a pressure of fifty pounds to the circular inch, not allowing

Your committee make these remarks as an act of justice; and they do it with the more pleasure, because it enables them to bestow a deserved compliment upon the American mechanics, who have so well illustrated their capacity and skill in the manufacture of the engines in question; proving satisfactorily, that in this, as well as in the other departments of human industry, their inventive genius is capable of the most elevated and useful flights. It is now but a few years since the universal voice called upon the Baltimore and Ohio Rail Road Company to follow the example of their neighbors and import their engines; and their perseverance in refusing to do so, although founded upon the very best and truest appreciation of circumstances, was stigmatized as folly or obstinacy. The result has fully justified the course, and shewed that their confidence in the skill of the artizans of this country to produce a more perfect machine than had yet been manufactured in England, and better adapted to the road from Baltimore to the Ohio, was fully warranted.

The capacity of a locomotive engine, when employed in heavy drafts depends upon three things:—1st. Its weight, which gives it the adhesion on the rails that is requisite—2d The capacity of its cylinders to use the adhesion to its utmost limit—3d. The ability of the boiler to supply the cylinders with steam equal to their capacity. Where the power is applied to but one pair of wheels but half the adhesion is used, supposing the weight to rest equally on the four wheels. Where the power is applied to both pair, the weight of the whole engine is made effective to produce adhesion. The English engines generally have but one pair of wheels geared. The engines of the Baltimore and Ohio Rail Road Company have both pair geared. The weight of the engines, therefore, being equal, and there being enough steam to overcome the adhesion of both pair of wheels, the Baltimore engine must be double the effective power of the English engine. The larger the cylinders, in stroke and in diameter, there being steam enough to supply them, the greater the power they afford; and the cylinders of the Baltimore engines being twelve and a half inches in diamater, and twenty-two inches stroke, while the English engines rarely exceed ten or eleven inches in diameter, by seventeen or eighteen inches stroke, the former are, of course, the most effective, since the daily experience of the Baltimore and Ohio Rail Road Company shows the ample supply of steam which the peculiar construction of the boiler affords at all times. At the end of nine months of constant use, the tubes of the Baltimore boiler have been found on examination as perfect as when they were inserted, while in the English engine, the renewal of tubes is a constant source of expense and vexation. The number of tubes in the Baltimore engine is four hundred, while in the English engine it rarely exceeds one hundred and twenty, causing a proportionate difference in the fire surface, or capacity for generating steam, the heat applied in the furnace being the same.

Your committee state these facts, which are of easy comprehension, to shew that the superiority of the Baltimore engine over the English one of the same weight, is not a matter of accident only, or about which there can be any mistake, but an inevitable consequence of well known philosophical and mechanical principles.

for the weight of the lever and valve, which of course would add something to the pressure, as will be shown hereafter. The great powers of the boiler to generate steam were here displayed in the evaporation of water at the rate of at least six hundred gallons per hour.

The train was now reduced to 97.7 tons, exclusive of engine and tender, in order to obtain an increase of speed; upon starting, however, it was found that the fire had been suffered to get too low, and the too great addition of fresh coal was adverse to the desired result, the speed being now only at the rate of ten miles per hour, the same as before with the heavier train. The steam did not blow off in this latter trial, although at the conclu-

The engines of the Baltimore and Ohio Rail Road Company are manufactured by Messrs. Gillingham & Winans, at the company's shops. Both of these gentlemen were, for many years, in the service of the company, in the Department of Machinery, before they became contractors; and to them, together with the late Phineas Davis, the former contractor, is to be attributed the perfection of the present locomotive. Their establishment is a large one, employing upwards of an hundred workmen, and of itself is of great benefit through the employment that it gives, and the money which, necessarily, it is the means of circulating. The company has a prior claim to the service of the contractors, paying a stipulated price for the engines, ($5,000) and the machinery which are obtained from them, and paying for repairs by the time which they consume. The expenses of the shops are borne by the contractors, who build and manufacture for others as well as the company. The shops and permanent machinery have cost the company about $10,000, which sum has been aleady returned to it in the reduced price for which the contractors build the engines, in consideration of the advantages of the use of the shops, the proximity to the road, and the opportunities of working for other companies.

In the annual reports of the Baltimore and Ohio Rail Road Company, the power of their engines has frequently been mentioned; and the authority and character of these reports have been quite sufficient to authenticate the facts therein stated. Your committee are aware, however, that the incredulous as to the ascent of the planes at Parr's Spring Ridge, have not been few, and perhaps, the very importance of the results stated, so far exceeding all previous experience, has been the cause of doubt; or in other words, "the news was held to be too good to be true." Your committee, however, are witnesses, with many others, to the surprising efforts and efficiency of the engineers in question, and they are glad that an opportunity has been afforded them, to add their testimony in corroboration of that which reflects so much credit upon the mechanics of our country, and to express their approbation of the persevering and patriotic individuals who, in the management of the Baltimore and Ohio Rail Road, have called our native talent into play, and done so much to develope and increase the efficiency of the rail road system.

All which is respectfully submitted,

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WALTER BALL,
SAMUEL HARKER,
J. B. SEIDENSTRICKER,
JOSHUA DRYDEN,
JOHN SCOTT,
HENY MYERS,
} *Committee First Branch.*

WILLIAM REANEY,
SAMUEL READY,
JAMES FRAZIER,
F. LUCAS, Jr.
} *Committee Second Branch.*

sion the pressure had evidently increased. After coming to rest upon the ascent, the engine readily commenced motion, and again advanced up the ascent with the 97.7 tons. The commencing of motion upon the ascent and in a direction up it was not attempted with the one hundred and sixteen tons, five hundred weight attached, but no doubt is felt that success would have attended such a trial.

The friction of the ten cars that composed the last mentioned train of 97.7 tons, was now ascertained by men drawing the cars mostly two and two at a uniform speed down the regular descent of twenty feet to the mile, or one in two hundred and sixty-four, by means of a rope and weights, the former passing over a pulley attached to the car. By this means we ascertained the force which, co-operating with gravity upon the inclination, would measure the friction, or resistance on a level. This force we found to average in the ten cars, about four and a half pounds per ton, and the co-operating gravity being eight and a half pounds, the friction was found to be thirteen pounds per ton on an average. Time did not permit of further extending either the trials of the engines or the examination of the cars, and we therefore assumed the friction of the remaining cars to be at the same average rate of thirteen pounds per ton; and it should here be stated that the friction of six of the ten cars was found to average 11 5-8 lb. per ton, and of eight of them 12 lb. per ton. Two of the cars were therefore so much out of order as to require double the average force to move them, and at the same time to increase the traction of the whole train from twelve to thirteen pounds per ton.*

From these trials upon the Washington branch railway, the following results are deduced: viz.

The Davis and Clinton engines each drew up the ascent of 1 in 264, 116 tons, 5 cwt. Therefore, lb.

Friction of 116.25 tons, at 13 lb. per ton	=	1511
Gravity of 130.25 tons, at 8½ lb.	=	1107
Traction	=	2618

* The friction upon the Liverpool and Manchester railway, according to *Pambour*, is eight pounds per ton. In these carriages the wheels were thirty-six inches and the journals one and three-fourth inches in diameter, whereas in the double cars above mentioned, the wheels are thirty inches and the journals two inehcs in diameter. And it will be 30 : 36 : : 8 : 9.6 and 1 3-4 : 2 : : 9.6 : 11 very nearly = the friction per ton due to wheels of thirty inches and journals of two inches in diameter, and the greater number of the double cars had a friction of only 5-8 of a pound more than this. When cars with only four wheels are used the journals may be and generally are 1 3-4 inches in diameter, and in that case the friction would be 9.6 lb. per ton, and it was rated in the last annual report, page 76, at 9.5 lb. per ton, on a straight road. The thirty inch wheel of cast iron has been preferred here on account of its comparative cheapness and lightness, as well as superior adaptedness to the traversing of curvatures; all of which properties are of considerable importance.

The Davis drew at the slow rate of 3 miles per hour, 131 tons up the same ascent.

		lb.
Friction of 131 tons, at 13 lb. per ton	=	1703
Gravity of 145 tons at $8\frac{1}{2}$ lb.	=	1232
Traction	=	2935

The Davis readily commenced motion upon the same ascent, and in a direction up it, with 97.7 tons.

		lb.
Friction of 97.7 tons, at 13 lb. per ton	=	1270
Gravity of 111.7 tons, at $8\frac{1}{2}$ lb.	=	949
Traction	=	2219

A locomotive engine, similar to the foregoing, and made by Gillingham and Winans at the shops of the Baltimore and Ohio Rail Road Company, has recently been placed upon the Patterson and Hudson Rail Road, in New Jersey. From an authentic source we learn that on the 29th ult. this engine conveyed over the road a train weighing, exclusive of the engine and tender, sixty-six tons; and that one mile of the distance upon which the ascent is nearly uniform, at the rate of forty-five feet per mile, was traversed in the ascending direction in four minutes, twenty seconds, or at the rate of 13.85 miles per hour. The fuel used was anthracite coal from the Lehigh. The friction upon the plate rail, such as is laid in the Patterson road, and with moderate curvatures has been assumed at twelve pounds per ton with thirty inch wheels and one and three-fourth inch journals; the diameter of the wheel used upon that road, however, being thirty-six inches, and that of the journal, it is believed, one and seven-eight inches, therefore by the proper reduction, the friction, or resistance per ton is found to be 10.7 lb. And moreover, as the road upon this ascent is straight and in good order, and the cars well appointed and comparatively new, it is probable that the resistance did not exceed nine pounds per ton. Assuming this, the calculation will be, viz:

		lb.
Friction of 66 tons, at 9 lb. per ton	=	594
Gravity of 80 tons, at 19 lb.	=	1520
Traction	=	2114

Considering the speed of $13\frac{85}{100}$ miles per hour, this is the greatest result we have yet related.

We shall here tabulate the foregoing results and some others that have been previously obtained and published in the reports, together with such as have been, and are now, estimated as entirely practicable.* And we have calculated and placed in this

* See Table (A) page 49.

table the equivalent performances in each case, at the velocity stated, upon a level, as well as upon ascents of 25, 52.8, 66, 92, and 100 feet per mile, showing the number of tons, including cars which the engine will draw, exclusive of itself and tender. For instance, the performance, number five from the top, gives 31.7 tons which might have been drawn up an ascent of one hundred feet to the mile, at 11.48 miles per hour by the engine "George Washington:" and, allowing five passengers and their baggage, added to the proportioned weight of the car, to each ton gross, the effort is equal to conveying a train with one hundred and fifty passengers, at eleven and a half miles per hour, up an ascent of one hundred feet in the mile. Likewise in number ten is 40.5 tons in the column of ninety-two feet ascent, and speed ten miles, which shows that the engine "Phineas Davis" could draw up that ascent two hundred passengers at ten miles an hour. And by comparing this with number one in the table, it will be seen that the engines now in use here have at least twice the power of those of 1833, or which were then in contemplation.

The pressure of the steam in the boiler having claimed attention, it was desirable to ascertain its amount in the more recent trials of the engines. Each engine is provided with two safety valves, calculated to blow at a pressure of fifty pounds per circular inch, or about sixty-three pounds per square inch. The experiment, number twelve in the table, in which the "P. Davis" drew one hundred and thirty-one tons at three miles an hour, up an ascent of twenty feet to the mile, afforded data by which to calculate the effective pressure, inasmuch as the steam was gently blowing off during the trial, at the same time the engine evidently worked to the extent of its power, as it could not increase in speed beyond the uniform rate mentioned. There was an equilibrium therefore between the *power* and the *resistance*.

The diameter of the cylinder being twelve and a half inches, its area is found to be 122.7 square inches, and of the two cylinders 245.4 square inches, which multiplied by the pressure per square inch upon the piston will represent the power per unit of velocity in the latter. The engine wheel upon the railway being taken at three feet in diameter, and the gearing by means of the spur and pinion such, that each stroke of the piston, through a space of twenty-two inches in length, impels the carriage upon the rails a distance equal to one circumference of the wheel, therefore the ratio of the velocities of the piston and a point on the circumference of the wheel is as 22 to 113.1, or as 1 to 5.14. Then, if p = the steam pressure per square inch, and r = the resistance at the rails or circumference of the wheels, the state of equilibrium gives the equation $245.4\ p = 5.14\ r$: whence $p = \frac{5.14\ r}{245.4}$. r = the entire resistance overcome by the engine, determined as follows:

We have already calculated the resistance of the 131 tons from the ascertained friction of the cars, and the known gravity on the descent, to be	lb. 2935
Add for friction of the tender, ...	66
Friction of the engine without a load, . . .	150
Do. of do. consequent on the load, equal to 244 tons, drawn on a level road,	244
	r = 3395

Then $p = \frac{5.14 \times 3395}{245.4} = 71$ lb. as the steam pressure per inch on the pistons; and from the well chosen areas of the steam pipes and valves, there is no doubt but that the pressure is the same both in the cylinders and the boiler; and indeed it could not be otherwise from the slow motion of the pistons in this instance. And such in fact was about the actual pressure that we found by another method to obtain, viz: by calculations resulting from an examination of the safety valve and its fixtures, as we shall now proceed to explain.

The valve itself weighs two pounds, and is a circle two inches in diameter, in contact with the steam at the inner part of the conical seat; and it has a *miter* expanding the valve to 2.375 inches in diameter at the top of the seat. The valve is held in place by a lever 18 inches in length, pressing upon it two inches from the fulcrum, which is at one end of the lever; whilst at the other end, a spring balance attached indicates the pressure in pounds weight. Now the calculation is such that the steam will commence blowing off with the index at twenty-two on the plate of the balance; signifying a weight of 22lb. at the end of the lever pressing upon the valve in the ratio of 18 to 2, or of 9 to 1; that is, equal to $22 \times 9 = 198$lb., which, as there are four circular inches in the valve, indicates a pressure of 49.5lb. per circular inch: And hence, 50 lb. upon the circular inch has been the reputed working pressure of these engines. But the area of the valve in contact with the steam at the instant previous to blowing, is only equal to 3.1416 square inches, and therefore $\frac{198}{3.1416} = 63$lb. is the pressure per *square inch;* and to this must be added the pressure at the valve, necessary to balance the gravity of the valve itself, and the force at the valve due to the weight of the lever and to the rod and plate of the spring balance. This weight, at the end of the lever where the balance is attached, amounted, upon actual weighing, to 2.5lb., and, multiplying by 9, to 22.5lb. at the valve; to which add 2lb., the weight of the valve, as already stated, and we have 24.5lb. as the correction upon the entire area of the valve, or $\frac{24.5}{3.1416} = 7.8$lb. upon the square inch.

Therefore,	*lb.*
The pressure per square inch due to the mark 22, upon the spring balance, - - -	= 63.
And the pressure due to the weight of the valve and fixtures, - - - - - -	= 7.8
Total pressure per square inch in the boiler at the instant of blowing off steam, - -	= 70.8

We thence assume the pressure upon the pistons, when the steam is blowing off, at 70lb. per square inch. It is probable, however, that as soon as this conical valve is raised from its mitered seat, the pressure becomes rather less than before, or at least, it does not increase: and there is placed in the tabular column of the steam pressure, the numbers "63 to 70," indicating that this force may vary accordingly.

In No. 10, of the table where the Davis drew 116.25 tons besides itself and tender up an ascent of 20 feet per mile, at 10 miles per hour uniformly.

	lb.
The resistance from friction and gravity is stated at -	2618
Add for friction of tender, - - - - - -	66
For friction of Engine unloaded, - - - -	150
For do of do in consequence of load, -	201
And the total resistance was probably, - -	= 3035

Whence $r=3035$, and we obtain $p = \frac{5.14\,r}{245.4} = \frac{5.14\times 3035}{245.4} =$ 63.6lb. as the actual pressure per square inch; at the same time, and during the whole of the experiment, the index marked 23.5 on the plate of the spring balance, whilst the steam blew off with much rapidity. This example appears to prove that from the raising of the valve the pressure of the steam fell about 7lb. to the square inch. In fact, no sooner is the valve raised from its seat than the steam, which previously had pressed only upon the horizontal section of the valve of two inches in diameter, begins to act powerfully upon the conical surface, by which the virtual horizontal area subject to the pressure, is increased: And if this augmentation be only such as would result from a virtual increase of diameter of no more than the one-sixth of an inch, the pressure would be only 63.6lb. per inch, whilst the index showed 23.5 upon the scale. In this manner the pressure upon the square inch may vary from 63 to 70lb. as above supposed.

Having given the powers of the Baltimore locomotive engines, it may be proper for a still more perfect understanding of them to advert to the performances of the locomotive engines in England; and for this purpose I shall be confined to what is related in "A practical treatise on Locomotive Engines upon Railways,"

London, 1836, by Chevr. F. M. G. De Pambour, concerning the action of these engines upon the Liverpool and Manchester rail way in the year 1834; a treatise that is incomparably superior to any other yet published upon the subject of steam locomotion.

Chap. IV. art. 2, sec. 2, p. 143 to 146, contains an account of two experiments with the "Vulcan" Engine, which are again stated in tabular form, p. 234.

The Vulcan weighs 8.34 tons,* with two cylinders each 11 inches diamater and 16 inch stroke, and wheel 5 feet diameter; the tender, towards the conclusion of the journey, 5 tons.

It is stated on p. 234, that in going from Manchester to Liverpool the Vulcan drew 34.07 tons exclusive of itself and tender up an ascent of 1-89, being 59.3 feet per mile, at a velocity of 11.42 miles an hour, the effective pressure of the steam being 57.5lb. per square inch: And in travelling from Liverpool to Manchester on the same day, July 22d, 1834, the same engine drew 36.32 tons exclusive of itself and tender, up an ascent of 1.96, being at the rate of 55 feet per mile, at a velocity of 18.75 miles per hour; the pressure of the steam being the same as before, viz. 57.5lb. to the square inch. The former being stated in the same table as equal to the traction on a level of 183 tons, exclusive of the tender, at 11.42 miles per hour; and the latter as equal to the traction of 181 tons on a level, exclusive of the tender, at a speed of 18.75 miles an hour!

The engine and tender, in the two experiments, being the same; the pressure of the steam the same; the number and class of the coaches the same; and the resistance overcome being very nearly the same; how is it possible to reconcile the two very different velocities of 11.42 and 18.75 miles per hour?

Turning to p. 143, &c., where the particulars of these experiments are detailed, we find that the Vulcan "ascended *Sutton* inclined plane with a first class train of nine carriages, amongst which were the mail and two empty trucks; weight of the train, tender included, 39.07 tons. The velocity of 26.6 miles, before arriving at the plane, settled at the rate of 20 miles an hour for the first half of the ascent, took then an average of 11.42 miles, and went down to 7.5 miles in the last quarter of a mile of the ascent, which is a little steeper than the rest. The spring-balance of the engine, fixed at 31, as a point of departure, marked 36, which by the mercurial guage corresponds to 57.5 lbs. effective pressure per square inch." Again, "As we have said, the average velocity of the ascent was 11.42 miles per hour, and the velocity at the top of the plane 7.5 miles per hour. In all the experiments we give those two velocities separately, because

*This is supposed to be the weight of the Engine without water in the boiler, or coke in the fire box, but I do not see the fact stated. The weight of the Engine *Phineas Davis* is 7.55 tons, and with the water in the boiler, and anthracite coal in the fire place, 8.7 tons.

the engine having a great impulse on arriving at the plane, we wish as much as possible to disengage that acquired velocity from the velocity proper to motion. If we were to take 11.42 miles as the velocity of the motion, it would be a little too much, being complicated with the first impulse. On the other hand, by taking 7.5 miles we should commit a contrary error, because the last quarter of a mile of the ascent is steeper than the rest, and surpasses the inclination of 1–89, on which our calculation is founded."

The area of the two cylinders each 11 inches diameter is 190 square inches, which multiplied by 57.5lb. the pressure gives 10925, the force on the pistons. The 16 inch stroke propels the 5 feet wheel upon the rail a semi-circumference, and consequently the ratio of the velocities of the piston and carriage upon the railway is as 16 to $5 \times 12 \times 3.1416$, or as 1 to 5.89; whence the force at the pistons of 10925lb. is equal to $\frac{10925}{5.89} = 1856$lb. at the periphery of the wheels, which is the power of traction.

The wheels of the coaches being 3 feet and the journals $1\frac{3}{4}$ inches in diameter; likewise the railway being almost exactly straight and in good order, the friction was found to be about 8 lb. per ton, and hence the resistances from friction of the tender and coaches, and from gravity of the entire train on the inclination of 1—89, amount to 1506 pounds.

The power applied is - - - - -	1856 lbs.
The resistance of the train, - - - -	1506
And the friction of engine, - - -	= 350

The velocity due to this power was a little less than than 11.42 miles per hour.

On the same day "the same engine, the Vulcan, ascended *Whiston* plane with a first class train of nine carriages, amongst which which were the mail and two loaded trucks; weight of the train, tender included, 41.32 tons. The velocity remained uniform during the ascent at 18.75 miles an hour, diminishing only to 12 miles an hour on the last quarter of a mile. The balance fixed at 31 marked 36, or effective pressure by the mercurial guage 57.5 pound per square inch in the boiler.

This experiment gives,

1856 lbs. power,

1489 resistance, equal to 186.t. on a level.

367 corresponding friction of the engine."

The friction of the Vulcan without a load, =	lbs. 136
The friction consequent upon the load of 186 tons on a level, = - - - -	186
Calculated friction of engine in this experiment. See pages 156 and 157, - - -	= 322

And leaving a surplus of power of only 45 lbs. in the second, and of only 28 lbs. in the first experiment.

It is evident from these details that the velocity due to the power in the first experiment was not equal to the traction of 1506 lbs. inc'uding the tender, or of 1466 lbs. exclusive of it, at a velocity of 11.42 miles per hour, as this speed was partly owing to the momentum acquired in a previous higher velocity. The uniform velocity with this load it is probable, would have been about 10 miles an hour.

Of the second experiment it must be premised that the velocity of 18.75 miles an hour resulted from the high velocity with which the train approached the inclination, as is evident from the fact that in the first experiment the previous velocity of 26.6 miles was soon lessened to one of 20 miles an hour, and ultimately to about 10 miles, the steam pressure being exactly, and the load very nearly, the same,—we are not left, however, to draw this conclusion only from the first experiment, as it is expressly stated in relating the particulars of the second, that from the great speed of 18.75 miles the velocity fell to 12 miles an hour upon the last quarter of a mile of the ascent, the length of which is about 1.5 miles. The language used would seem to imply that 18.75 miles an hour was the average velocity on the first five quarters of a mile of the ascent, and that 12 miles was the average velocity upon the next and last quarter of a mile; if so, the proper speed in question would be less than 12 and might not exceed 10 miles an hour. These conclusions will appear the more certain when it is considered that the pressure of the steam was exactly the same in both cases, whilst the loads differed only 17 lbs., or less than one per centum of the power employed; the power in each case being 1856 lbs. and the resistance, exclusive of the friction of the engine and tender, in the one case 1466 lb. and in the other 1449 lb.

In the experiment with the Davis engine on the branch rail road leading from Baltimore to Washington, No. 11 in the accompanying table, the traction, or resistance exclusive of the friction of engine and tender, was found, by a careful investigation at the time of the friction of all the cars employed, to be 2219 lb.

Friction of tender, - - - - - -	66
Do of engine unloaded, say, - - - -	150
Do of engine due to the load, - - -	185
Total resistance, = - - - - -	2620

The area of the cylinders being 245.4 square inches, and the velocity of the train being 5.14 times that of the pistons, therefore, $\frac{2620 \times 5.14}{245.4} = 55$ lbs. is the pressure of the steam that must have been employed in this experiment.

The respective weights of the Vulcan and the Davis are 8.34 tons and 8.7 tons, unless the former is the weight without fuel

and water; and if the weight of the latter must be compared likewise without fuel and water, it will be 7.55 tons. The velocities and steam pressures of the two engines, in the related experiments were also about the same; consequently their powers of traction (beyond the friction of the engines and tenders) at a velocity of 10 miles an hour are as 1466 to 2219; that is, the Davis engine with cylinders of 29 per cent. greater area, is 51 per cent. more effective than the Vulcan; this must be chiefly owing to the greater capacity of the boiler of the former engine to generate steam.

The horizontal tubular boiler of the Vulcan evaporated, in the experiments detailed, at the rate of 57.92 cubic feet, equal to four hundred and thirty-three gallons of water per hour, with a surface exposed to the radiating heat equal to 34.45 square feet, and an amount of surface in the tubes acted upon by communicative heat, of 307.38 square feet. The tubes in the Vulcan are 6.5 feet in length, and their effect per unit of surface in generating steam is only one-third part of that of the surface exposed to the radiating heat, (see page 179,) whence the effective surface is $34.45+\frac{307.38}{3}=137$ square feet. The maximum average volume of water evaporated per hour for each effective square foot in the best English engines is .401 of a cubic foot: at this rate the Vulcan would evaporate 54.937 cubic feet, being something less than the actual result.

In the experiment with the Davis, numbered ten in the table, the quantity of water evaporated exceeded the rate of six hundred gallons per hour, during the 24 minutes continuance of the trial. The vertical boiler of this engine, has, of surface exposed to the action of radiating heat thirty-two square feet, and to communicative heat in the tubes three hundred and four square feet. And the effective surface by the rule for the English boiler, would be $32\times\frac{304}{3}=133.33$ square feet; being very nearly the same as in the Vulcan. The position of the tubular surface in the vertical boiler is, however, much more favorable to receive heat than in the horizontal boiler In the former the tubes being each only thirty-one inches in length, therefore the surface of three hundred and four square feet is situated at an average distance of 15.5 inches from the fire at the top of the fire-box; whilst in the latter, the length of each tube being seventy-eight inches, the 307.38 feet of tubular surface is placed at an average distance from the fire at the *side* of the fire-box, of thirty-nine inches. It is evident then that the tubular surface in the Davis must be greatly more effective, than that in the Vulcan. Allowing the gain from position to equal the difference between the one-third and one-half, the effective surface would be increased from 133.33 to 185 square feet, whilst the evaporation per hour would be seventy-four cubic feet, or five hundred and fifty-five gallons. In

addition to this advantage in the tubular arrangement, these engines are provided with a tubular apparatus for heating the water previous to its injection into the boiler. From a due consideration of these advantages, added to the blast, it will not be difficult to appreciate the great powers of the vertical boiler as employed in the Baltimore engines.

The maximum power of the *Atlas* engine of 11.4 tons weight with cylinders twelve inches diameter, and steam pressure of fifty-five pounds per square inch (p. 148,) the velocity averaging eight miles per hour, was one thousand nine hundred and twenty-one pounds traction, but exclusive of the tender, one thousand eight hundred and eighty-one pounds. Whilst the power of the Davis engine of at least 2.7 tons less weight, and steam at the same pressure upon cylinders twelve and a half inches diameter, and speed ten miles per hour, was equal to a traction of two thousand two hundred and nineteen pounds, being eighteen per cent. more than the Atlas.

In the tabulated results, pages 228, 229, the "*Fury*" engine with a pressure of 65.5 pounds per square inch is stated to have drawn a load, including the tender, equal to two hundred and forty-four tons on a level at 6.31 miles per hour; and at a steam pressure of sixty-seven pounds to the square inch, a load equal to two hundred and twenty-eight tons at fifteen miles per hour upon a level.

Upon an inspection of the details, p. 149, it is seen that the velocity of 6.31 miles is an *average*, and that the velocity at the top of the *Whiston* plane upon which this experiment was made, the rate of ascent being uniform to the top, was only at the rate of 3.33 miles an hour. In this case the power was two thousand one hundred and fourteen pounds, and the resistance one thousand nine hundred and fifty-one pounds; leaving for the friction of the engine, one hundred and sixty-three pounds, which is too small by one hundred and ninety pounds; see the average on p. 156, 157. Consequently, if the plane had continued, the engine must soon have come to a stop.

The other experiment is thus related: "the *Fury* ascended *Sutton* with a train of ten waggons, weighing 43.8 tons and 48.8 tons, including the tender; balance fixed at thirty-two and marking thirty-six, or effective pressure sixty-seven pounds; velocity fifteen miles an hour. The engine drew its train with evident ease."

lb.
"2162 power.
1825 resistance, equal to 228 tons on a level.

337 corresponding friction of the engine."

		lb.
The friction of this engine without a load is	=	109
The friction of engine due to a load of 228 ton	=	228
		337

Here is no surplus of power, therefore, to maintain, much less to originate, a velocity of fifteen miles an hour. This velocity of fifteen miles, therefore, must have been the *average* velocity, although, inadvertently, not so mentioned; and this conclusion will be confirmed on looking at the result of an experiment with the same engine, in which an *average* velocity of 13.33 miles an hour (the *minimum* being ten) was had when the power exceeded the resistance from one hundred and eighty-three tons on a level, by three hundred and nine pounds.

		lb.
Here the friction of the engine without a load	=	109
The friction of the engine due to the load	=	183
Friction of engine	=	292
Excess of power	=	309
Surplus power,	=	17

We have seen that the Vulcan, with an excess of power equal to three hundred and sixty-seven pounds, (p. 146,) when the resistance was equal to one hundred and eighty-six tons on a level, had the velocity reduced from an average of 18.75 miles to that of twelve miles on the last quarter of a mile.

		lb.
Friction of Vulcan without a load (p. 156)	=	136
Do. Do. in consequence of load	=	186
		322
Excess	=	367
Surplus	=	45

It is obvious, therefore, that the fifteen miles in the case of the Fury engine, is an average of which the *minimum* might be ten miles an hour.

Considering it unnecessary for the present occasion to extend the examination of these experiments, it may be added that both the Baltimore and the English engines are very efficient machines, and that whilst the latter from the size of its wheels will have an advantage in speed upon a comparatively straight road, the former from the peculiar arrangement of its boiler and gearing will have the advantage in point of power of traction, and in traversing roads of much curvature, or of steep inclinations.

Attentively considering the action of the engines and their several powers, it is evident that the boiler, as at present arranged, will generate a sufficiency of steam to work with cylinders of fourteen inches in diameter. It is accordingly proposed that an engine with such cylinders be constructed, the weight of which not to exceed eight and three-fourths or nine tons, inclusive of fuel and water in the boiler. This engine would have as much effective power with the steam at fifty pounds pressure per square inch, as the best engines now have with a pressure of seventy pounds; whilst with a pressure of fifty pounds the adhesion up-

on the rails of $\frac{1}{8.4}$ would be a sufficient fulcrum: at the same time the engine should be furnished with cams calculated to work either with full pressure, or expansively with a cut-off at about half the stroke. In this way steam would be economised, and the greater powers of the engine reserved for occasions of high grade, or of much increased resistance from whatever cause.

Such is the unevenness of the country generally in a direction from the Atlantic to the Ohio that the higher grades and considerable curvatures must be employed in the formation of railways to connect the sea board with the interior. The great powers required to overcome the resistances upon such roads entails the unavoidable necessity of engines of heavy construction, and as a consequence, the railway itself must have a corresponding strength and permanence. Of the materials employed in the construction, there should be as little that is perishable, and as much that is durable, as the nature of the case will admit of; and the iron rail should be of the edge kind, weighing about 60 lb. to the lineal yard. However, as a more fitting occasion than the present may arise for a discussion of the composition of the railway best suited to the action of locomotive engines, I forbear enlarging upon this topic.

Surveys preliminary to the continuation of the rail road to the Ohio river at the cities of Wheeling and Pittsburg, ordered by the board on the 5th of April last, in consequence of the tender of subscriptions on the part of Baltimore and Wheeling respectively, and of the expected aid from the State of Maryland and from Pittsburg, were to be commenced at some point near Harper's Ferry, and at such other point as might be deemed expedient, in order, in the first instance, to enable the board to effect a location of the rail road to the summit of the Alleghany mountain as early as the same could be accomplished.

In pursuance of this order, and with the advice and verbal instructions of Philip E. Thomas, the then president of the company, four surveying parties were organized and sent into the field as soon as practicable; that is to say, the *first* under the general direction of Caspar W. Wever and particular direction of John D. Steele, and charged with the field operations between the rail road as now constructed near Harper's Ferry, and the eastern entrance of the pass of the North Mountain by the Potomac river. The *second*, under the immediate direction of Oliver C. Morris, directed to extend the survey thence up the river, and upon the Maryland side of it until he should close lines with the survey of Henry R. Hazlehurst. The *third* directed by Henry R. Hazlehurst, instructed to commence at the town of Cumberland, and to extend the experimental survey down the river, in Maryland, until a union of his line with that of Oliver C. Morris should be effected: And the *fourth* party, under the charge of William P. Swann, was directed to make certain experimental surveys from Cumberland to the summit of the mountain, divi-

ding the eastern and western waters, or rather to a point on Casselman's river a few miles west of that summit, and necessary to be traced in connexion with the line or lines east of the summit.

Early in the month of July, the two parties under O. C. Morris and H. R. Hazlehurst, having finished the preliminary surveys as directed, on the Maryland side of the Potomac, between the North Mountain and Cumberland, they were ordered to Savage Mountain, in order to engage in the requisite experimental surveys between Cumberland and Casselman's river: All the lines which these two parties could trace, previous to their recall to the Potomac valley, in addition to those to be run by the party under W. P. Swann, being necessary to such a development of facts as would enable us to choose the best route for the road in that region from Cumberland to the summit of the Alleghanies. After effecting a junction of the lines on the Maryland side of the Potomac, between the North Mountain and Cumberland, it was intended likewise to trace lines upon the Virginia side of that river; but the unhealthy part of the season in this valley being then near at hand, it was thought best to transfer the two parties to a more salubrious region, where their operations would be equally useful and necessary under the resolution of the board already referred to, and to cause their return to the Potomac valley in the autumn, after all danger from disease should be over.

Upon the resignation of Caspar W. Wever, and his retirement from the service of the company on the 1st day of July, John D. Steele was placed in full command of his party in the field, and, in the course of that month, closed his line at the beginning stake of O. C. Morris at the North Mountain, having passed through Pleasant Valley, from a point near Weverton, a few miles below Harper's Ferry, and thence by Boonsborough and Hagerstown. This party then returned and commenced a survey at a point in the Baltimore and Ohio rail road as now constructed, directly opposite to Harper's Ferry, under instructions to pursue the more level route along the ravine of the river, Antietan creek, &c., and avoiding the summit encountered upon the route through Pleasant Valley; but before the completion of this survey, several of the party were attacked with fever, in consequence of which, the field operations in Washington county were necessarily suspended until the return of a more healthy atmosphere.

The route as traced between Weverton and Cumberland, is about 108 miles, (being some 20 miles shorter than the canal line) and, therefore, by it and the rail road as already made, Cumberland is about 187 miles from Baltimore, and there is some probability that the distance may be reduced to 180 miles.

As the line has been run ascents of about fifty feet to the mile through Pleasant Valley, and likewise in passing the cut-off route by Fifteen mile and town Creeks, will be necessary—at the same time this line entirely avoids the vicinity of the canal line from Weverton to the North Mountain, forty-two miles, and from the

mouth of Fifteen Mile Creek to Oldtown, nineteen miles, together sixty-one miles; and leaving a distance from the North Mountain to Hancock, of sixteen miles, and thence to the mouth of Fifteen Mile Creek of fifteen miles, and from Oldtown to Cumland, sixteen miles, or in all, of forty-seven miles, situated in the immediate vicinity of the river, and frequently, and for considerable distances, in contact with the line of the canal. It will be impossible, however, to determine the necessary and expedient degree and extent of collision in the two works, and consequently to effect a conjoint location of them, as provided for in the act of assembly, and having a due regard to the public interests involved, until the contemplated surveys in Virginia shall have been made: And it is expected that these will be effected in the present autumn, and early part of the ensuing winter.

No estimate has yet been made of the probable expense of construction upon the one hundred and eight miles between Weverton and Cumberland, but from the roughness of the ground in Pleasant Valley, and in the vicinity of the Beaver and Antietan creeks, as well as in the great cut-off, between Fifteen Mile Creek and Oldtown, together with the great increase of expense that will be consequent upon avoiding the canal in some places where it will be near, and providing for a joint construction of the two works in others, the graduation and bridging will be very expensive, and it may, in fact, be good economy to cross and recross the Potomac so as to avoid, between the North Mountain and Cumberland, a great part of the heavy expense that would otherwise be caused by the proximity of the canal. The surveys when made, will doubtless develope the necessary facts to enable those whose duty it shall be, to decide upon the route in the most judicious manner, consistently with just principles and the best interests of all parties.

Upon the first day of July last, *Benjamin H. Latrobe*, in pursuance of his appointment by the board to the office of *Engineer of Location of the Baltimore and Ohio Rail Road*, entered upon the duties incident to his office, and from that day he has had the immediate charge of the surveys and direction of the several corps upon field duty. To his report, therefore, I must refer for detailed information in relation to these operations, and for a more circumstantial account of the results upon the several routes already adverted to, as well as upon those hereinafter mentioned.

Relative to the operations west of Cumberland, already alluded to, I may be allowed to remark in brief, that two practicable routes for the rail road, have been traced from Cumberland to Albright's farm, on the summit of the mountain that there divides the eastern and western waters. These two routes have a maximum grade of ninety-two feet to the mile; the one is route No. 3, of my report, on the reconnoissance, page 54, of the ninth annual report—Ascending upon the slopes of Wills' creek and

Jennings' run, and crossing the Savage Mountain *with a tunnel* of two thirds of a mile in length, passing about four hundred feet below the apex of the mountain; and the other is route No. 4, of the reconnoissance, described on page 56, of the ninth annual report, which likewise occupies the slopes of the streams just now mentioned, and crosses the Savage Mountain at the Cranberry Swamp, *without a tunnel.* A crossing of the Savage Mountain was likewise effected as described, and at the same two places by means of a practicable route of the same maximum grade of ninety-two feet to the mile, ascending by the slopes of Will's Creek and of Glatten's and Jenning's runs. These routes at the eastern end of the projected tunnel were also connected with the point upon the summit at Albright's farm by a devious route passing over the summit of the Savage Mountain at Rieber's farm, with an ascending and descending grade of ninety-two feet to the mile. The object of this line is the avoiding of the tunnel by passing over the natural summit.

The route of No. 6 of the reconnoissance, page 60 of the 9th annual report, and of a grade not to exceed 50 feet to the mile, has likewise been traced from Albright's farm to Cumberland, but from its roughness of character, the ground passed over is so unfavorable, that we are not prepared to say that it is *feasible;* at the same time it would perhaps be premature to pronounce it *impracticable.* Whilst, however, a route to attain the summit in question, and of an inclination not to exceed 50 feet per mile has not yet been proved impracticable, the belief is strengthened that a line of an intermediate grade between 50 and 92, and perhaps of from 60 to 66 feet per mile may be found: Or it may be, that much the greater part of the altitude can be surmounted with ascents not exceeding 66 feet per mile, whilst a comparatively short distance may have an inclination of 92 feet per mile: And the route No. 2, page 49, of the report above referred to, may turn out to be of this character. The route last mentioned will attain the summit at a point called the *Sand-patch*, several miles north-westwardly from Albright's farm, and about three-fourths of a mile from Absalom Baer's on the Somerset road. This line, together with others connecting the summit at Albright's, and also at the Sand-patch, with the ravine of Casselman's river and passing through a gap in Meadow Mountain, occupied by Flaugherty creek, will soon have been traced, by which means the relative merits of the several routes mentioned will be ascertained. It was deemed necessary in order fully to comply with the resolution of the 5th of April, already referred to, to extend these preliminary surveys from the summit to Casselman's river, a distance of from 10 to 15 miles, with a total descent of about 500 feet, as without doing so, the praticability of the route westwardly through the *Meadow* (here called *Alleghany*) mountain could not be known.

In compliance with thy instructions of the 22d ult., to that

effect, the party under the direction of John D. Steele, and which had been dispersed on account of sickness, was re-organized by that engineer, and by direction of the engineer of location, and detailed to the service of a re-location of the line of the Baltimore and Ohio rail road at Parr's ridge, in order to ascertain the practicability of dispensing with the present system of inclined planes upon that ridge, and of the feasibility of a route across the same, upon which the business of the road might be performed by locomotive steam power. It being intended that this party should resume its labors in Washington county upon the return of health in the valley of the Potomac.

From the results already had there is no doubt but that a line involving a comparatively cheap construction, may be traced across the ridge so as to pass the summit at the same point now occupied by the rail road, and at a grade not exceeding ninety-two feet in the mile. These surveys are, however, not sufficiently advanced to allow us to say whether this inclination should be reduced below this rate much less to enable us to point out the line of definitive location best adapted under all the circumstances of the case, to the object in view.

These planes were located in June, 1831, at which time it was believed that the inclination of a rail way, for general trade and intercourse, should not be allowed to exceed about thirty-five feet to the mile, especially where a considerable degree of curvature was admitted, unless the power employed should be that of fixed engines, in which case the ascents beyond this rate would be concentrated in inclined planes, to be worked by those stationary engines by means of ropes and other apparatus suited to the occasion: And in accordance with the only correct principles that then prevailed in the laying down of railways, the system of inclined planes at Parr's ridge, was adopted, and the road constructed accordingly. The erection of stationary engines and their fixtures, upon the planes, has, however, been deferred from time to time; animal power being employed as a temporary substitute. Finally it has become obvious, from improvements in the locomotive engine, that the fixed engine might be altogether dispensed with, and that, by a proper modification of the road the action of the locomotive engine could be advantageously extended across this ridge, and throughout the entire line of the road.

No very essential improvement in the working of stationary steam engines, has been effected within the last four or five years, or even within the last ten years. Not so, however, with the *locomotive engine.* This engine has undergone very great improvements in that time; such indeed, as almost to entitle it to the appellation of a new machine. And the most important of these improvements have been effected within the last three or four years. Up to the year 1829, the use of the locomotive engine was mostly, if not wholly, confined to the conveying of

coals upon three or four roads in England. And in that year the investigations of Rastrick and Walker for the Liverpool and Manchester Railway Company, led them to adopt 19½ tons gross, including waggons, but exclusive of engine and tender, as the greatest load which a locomotive engine of eight tons weight, with steam at fifty pounds to the square inch, should draw upon a level road at ten miles an hour; and they found that the engine could barely convey itself and tender at the speed proposed up the inclinations of 1–96. or 55 feet to the mile, which had been introduced in two instances upon that railway. Consequently they decided in favor of the employment of stationary power at those places. Much difference of opinion, however, existed as to a preference between the use of *fixed* and *locomotive* engines even on the level parts of the railway, and it was under such circumstances that the Liverpool company offered, in that year a premium for a locomotive engine of given properties, the most important condition being that it should be capable of drawing after it upon the level parts of the railway *twenty* tons including the tender at the rate of ten miles an hour with a steam pressure of fifty pounds to the square inch.

In the month of October, of the same year, 1829, several new engines appeared upon the road and competed for the prize, which was ultimately awarded to the "Rocket" engine, the performance of which was equal to the conveyance on a level of 9½ tons, exclusive of the engine and tender, at the rate of fourteen miles per hour. Wood on rail roads, 1831, p. 373, London edition.

From this time the engine has been gradually advanced in efficiency, and in the year 1831 there appeared no advocates for stationary power upon the Liverpool and Manchester road. The engines upon that road have since arrived at twice the power which they had in 1831. At the close of the year 1830 the first train of cars laden with *merchandize* passed from Liverpool to Manchester, at which time there were ten engines constructed for, or in use upon, that road; and it will be seen from a statement in *Pambour*, p. 333, that the subsequent improvements made in the course of the next three years had the effect of throwing out of use the whole of these ten engines. He states that of the thirty locomotive engines owned by the company in the year 1834, about one-third were then useless. Being of the earlier construction, and made at a time when the company had not yet obtained sufficient experience and they were found to be out of proportion with the work required of them. Thus, the same author adds, that of the thirty engines mentioned, ten are in constant activity upon the road; ten are being repaired or are in reserve; and ten are nearly abandoned for the reason already assigned.

Upon the Baltimore and Ohio Rail Road the curvatures were so great, being of a radius of four hundred, and in one instance

of three hundred and eighteen feet, that many doubted the practicability of running locomotive engines upon it. However, in consequence of the perseverance of the President and Directors of the company, an engine was placed upon the road in the year 1831, that could traverse all the curvatures with facility, and convey fifteen tons at a speed of fifteen miles an hour, *on a level*, the fuel being anthracite coal; see page 23 of the 5th annual report.

In two years from that time, that is, in the year 1833, the engines upon this road were of such power as to authorise for the Washington branch, an estimated power of traction equal to 1120 lb. or of the conveyance of fully ninety tons on a level at a velocity of ten miles an hour, being equal to that of thirteen tons (exclusive of the engine and tender) at the same speed up an ascent of ninety-two feet to the mile. And it has been shown that an engine now upon the road has drawn 116¼ tons at ten miles an hour upon an ascent of twenty feet to the mile, the friction in this case having been ascertained to be 13lb. per ton, and therfore the power traction exerted, (beyond the friction of the engine and tender on a level) in overcoming the friction and gravity, was 2618 lb. at the speed mentioned. This is equivalent to the conveyance on a level of 218 tons, exclusive of the engine and tender, and up an ascent of ninety-two feet to the mile, of 40½ tons at ten miles an hour; the friction being in both cases assumed—at 12 lb. per ton. The present engine will therefore convey on a level, fully twice, and up an ascent of ninety-two feet to the mile, three times, the load that was contemplated three years since to be within the power of a locomotive engine upon these respective grades.

It is very obvious, therefore, that the efficient action of the locomotive engine, can now be extended to inclinations of a much steeper grade than formerly, or in fact, than were contemplated, even three or four years since. At the same time it cannot fail to be observed how very disadvantageous the steeper inclinations upon a railway are. It will be seen in the accompanying table before referred to, that, the friction being assumed at 12 lb. per ton, the useful effect of the engine on a level, is reduced to one-half upon an ascent of twenty-five feet per mile, to one-fourth at sixty-six feet per mile, and to one-fifth at ninety-two feet per mile. Consequently upon lines of great importance, and where the higher velocities must be maintained, in winter as well as in summer, the grade should approximate as nearly to a level as practicable. Where mountains intervene, however, a very near approach to a level being manifestly impossible, it then becomes necessary to suffer some decrease of speed, and in places, a much greater expense of transit, in order to insure the practicability of the project. And it is confidently believed, from a just view of all the attendant circumstances, that, upon a line of a mixed and reciprocal, but fluctuating business, and upon which the transit of persons will be an item of importance, steam, by

locomotion, may be advantageously extended to inclinations in the road of sixty-six feet, and even of ninety or one hundred feet to the mile, rather than resort to stationary engines upon inclined planes suited to their action.

Respectfully submitted,

J. KNIGHT,
Chief Engineer.

(A)

TABLE OF PERFORMANCES OF LOCOMOTIVE ENGINES

UPON THE BALTIMORE AND OHIO AND THE BALTIMORE AND WASHINGTON RAIL ROADS, &c.

Actual Performances.

LOCOMOTIVE ENGINES, Their designation and date of experiments, &c.	Weight in tons of Engine and Tender.	ACTUAL PERFORMANCES, &c.					Estimated equivalent performances in tons, exclusive of Engine and Tender on these several grades, curvature not more than 1000 feet radius, friction 12 lb. per ton.					
		Velocity miles per hour.	Ascent and Curvature.	Tons drawn.	Traction in lb.	Pressure of Steam square inch.	Level.	Ascent 25 feet per mile.	Ascent 52.8 feet per mile.	Ascent 66 feet per mile.	Ascent 92 feet per mile.	Ascent 100 ft. per mile.
July, 1833. Estimate upon the Washington Branch.	En. 6.5 Ten. 5.	10	20 ft. per mile. 3084 ft. radius.	50.75	1120		93.3	44.1	25.	20.	13.1	11.6
1834. "ARABIAN" upon the Balt. and Ohio Rail Road.	7.5	11.79	Level 1000 ft. radius	112.9	1355		112.9	54.	31.	25.	17.	15.
	5.0	6.	17 ft. per mile 1000 ft. radius	112.9	2270	63 to 70	189.1	94.6	58.	48.	34.8	32.
1835. "GEORGE WASHINGTON" upon the Washington branch.	8.5 5.5	20.	20 ft. per mile 3084 ft. radius	47.	1270		105.8	49.6	27.8	22.	14.1	12.4
Trial upon the Washington Branch.	8.5 5.5	11.48	20 ft. per mile 3084 ft. radius	113.	2322	63 to 70	193.5	96.2	58.3	48.2	34.7	31.7
1836. "ANDREW JACKSON" experiment on inclined planes at Parr's ridge, steam working at full pressure.	8.6 4.35	5.	197 ft. per mile 264 ft. per mile	12.9 7.85	2298 2404	63 to 70 63 to 70	191.5 200.	95.5 100.	58.3 61.3	48.3 51.	35. 37.	32. 34.
1836. "GEORGE CLINTON," Washington branch.	8.7 5.5	6.	20 ft. per mile 3084 ft. radius	116.25	2618	63 to 70	218.	109.	67.	55.6	40.5	37.

	LOCOMOTIVE ENGINES, Their designation and date of experiment, &c.	Weight in tons of Engine and Tender.	ACTUAL PERFORMANCES, &c. Velocity miles per hour.	Ascent and Curvature.	Tons drawn.	Traction in lb.	Pressure of Steam square inch.	Estimated equivalent performances in tons, exclusive of Engine and Tender on these several grades, curvature not more than 1000 feet radius, friction 12 lb. per ton. Level.	Ascent 25 feet per mile.	Ascent 52.8 feet per mile.	Ascent 66 feet per mile.	Ascent 92 feet per mile.	Ascent 100 ft. per mile.
Actual Performances.	1836. "PHINEAS DAVIS," trial on Washington branch.	8.7 5.5	7.	20 ft. per mile 3084 ft. radius	116.25	2618	63 to 70	218.	109.	67.	55.6	40.5	37.
	Same engine with steam at ful pressure without cut-off.		10.	20 ft. per mile 3084 ft. radius	116.25	2618	63 to 70	218.	109.	67.	55.6	40.5	37.
	do. do. do.		10.	20 ft. per mile 3084 ft. radius	97.7	2219	calculat'd 55	185.	91.5	55.	45.5	32.5	29.7
	do. do. do.		3.	20 ft. per mile	131.	2935	calculat'd 71	244.5	123.	76.	63.4	46.5	43.
	1836. Performance of an engine upon the Patterson and Hudson Railway.	8.7 5.5	13.85	45 ft. per mile	66.	2114		176.	87.	52.	43.	30.5	27.7
	1836. Train usually conveyed by one locomotive engine from Baltimore to foot of Planes at Parr's ridge.	8.7 5.5	8.	35 ft. per mile 400 ft. radius	57.	2253	63 to 70	187.7	93.	56.	46.4	33.2	30.3
Estimated Performances.	Estimate in my report of September, 1835, for Locomotive Engine performances across the Alleghanies.	7.5 4.5	10.	Adhesion $\frac{1}{8}$		2100	55	175.	87.3	53.5	44.	32.	29.3
		8.5 5.5	10.	Adhesion $\frac{1}{8}$		2380	63	200.	100.	60.	50.	36.	33.
	Proposed new locomotive engine for high grades; cylinder 14 inches diameter, and stroke 22 inches.	9. 5.5	10.	Adhesion $\frac{1}{8.4}$		2400	50	200.	100.	60.	50.	36.	33.
			10.	Same Engine when the friction is 10 lb. per ton.		2400	50	240.	109.	64.	52.4	37.3	34.

All the Engines named or alluded to in the preceding table have each two cylinders, with a 22 inch stroke; the diameter of the cylinder in the Arabian is 12 inches, and of the proposed new engine at last mentioned in the table, 14 inches ; of all the rest, $12\frac{1}{2}$ inches. The engines are each upon 4 wheels of about 3 feet in diameter, and (with exception of that first stated) have connections to bring into action the adhesion of the entire engine. They have likewise this peculiarity in Locomotive Engines, viz. they are furnished with cog gearing by means of a driver and pinion, the effect of which is that for every stroke of the piston, of 22 inches, the road-wheels of 3 feet diameter perform one entire revolution upon the rails, that is to say, the velocity of the engine upon the rail way, is to the velocity of the piston as 5.14 to 1.

J. KNIGHT, *Chief Engineer.*

REPORT

OF THE

ENGINEER OF LOCATION

OF THE

BALTIMORE AND OHIO RAIL ROAD.

ENGINEER'S OFFICE,
Baltimore, October 1, 1836.

To JOSEPH W. PATTERSON, Esqr.

President Baltimore and Ohio Rail Road Company.

SIR,—By my appointment as "Engineer of Location," on the 1st of last July, the immediate direction of the surveys then in progress for the extension of the Baltimore and Ohio rail road westward from its present termination in the valley of the Potomac, were committed to my charge, and in the performance of one of the duties thereby devolving upon me, I beg leave to submit the following report of the results of those surveys, so far as they have been developed at the present date.

In the months of April and May last, the Chief Engineer, under the orders of the Board of Directors, took the necessary measures for the commencement of the surveys in question, by the organization of four distinct parties, each under the control of an officer qualified to conduct the field operations of the service, under the instructions with which he furnished them for their government. It was deemed necessary to employ so considerable a number of persons in the prosecution of the surveys, in consequence of their great extent and complication, and the earnest desire entertained by all who were interested in the work, to know how far the nature of the country to be traversed in its westward progress, favored the proposed prolongation of it to its original destination at the Ohio river. The route through its entire length, presented many interesting questions with respect to its location, but the points of peculiar and pressing importance were two:

First—The crossing of the Alleghany range of mountains, from the eastern to the western waters.

Second—The ascent of the valley of the Potomac, from Harper's Ferry or its vicinity, to the eastern base of those mountains at the town of Cumberland. The difficulties to be surmounted in the accomplishment of the former object were alto-

gether of a physical description, dependant upon the bold features of the alpine region through which a passage was to be effected; while the obstacles to be overcome in the attainment of the latter, principally grew out of the preoccupation of the Maryland side of the valley by the Chesapeake and Ohio canal. In order, therefore, that the practicability of overcoming both of these impediments to the advance of the road might as speedily as possible be put to the test, a simultaneous survey of the whole distance between Harper's Ferry and the summit of the Alleghanies, was begun and carried on with a rapidity proportioned to the number of the parties engaged in its prosecution. Those parties having been originally formed, and their operations, up to the 1st July, directed, as above boserved, by the Chief Engineer, who, in his report will describe the names and spheres of duty of the officers commanding them, I will, avoiding a repetition of his statements in regard to those particulars, proceed to exhibit the facts determined by the services which they have respectively performed up to the present period.

I will speak first of the surveys in the valley of the Potomac, between Harper's Ferry and Cumberland, as they first present themselves in continuation of the road from its present termination. The State of Maryland in her subscription to the stock of the Baltimore and Ohio rail road at its last session, having required, under a penalty, that the route should be made to pass through Boonsborough and Hagerstown in Washington county, it became necessary in order to comply with that condition, that the extension of the road should take place, not from its present western extremity opposite Harper's Ferry, but from a point about three miles short of it, at Weverton at the mouth of Israel's creek, a stream watering Pleasant Valley, which lies between the Elk hill and the South Mountain—By this water course the oniy practicable exit from the Potomac Valley in the direction of Boonsborough, was to be obtained, unless, by selecting some place of departure still lower down the river, a crossing of the South Mountain were encountered. The line was therefore carried up Pleasant Valley, and over the summit which at the distance of seven miles from the Potomac unites the two mountains above named, by a transverse ridge, and divides the waters of Israel's creek from those of a branch of the Antietam—This summit was found about 490 feet higher than the level of the rail road at the river, and in order to pass over it with a cutting not exceeding 50 feet in depth, a uniform grade of 50 feet per mile was discovered to be necessary—Indeed this grade would not have been of sufficient steepness to accomplish the ascent had it been made to start from the level of the rail road at the mouth of Israel's creek. It became necessary to attain an elevation above the road of about 84 feet at that place, previous to the commencement of the proposed ascent, and this preliminary altitude was only to be obtained by actually leaving the exist-

ing track at a point about $1\frac{3}{4}$ miles down the Potomac, and rising at the same rate of 50 feet per mile along the end slope of the South Mountain which here breaks down to the river. In ascending Israel's creek an expensive graduation is encountered, the surface being furrowed by deep ravines of frequent recurrence, and involving heavy cutting and filling. The route is, however, quite practicable, and is direct in its general course, and without curves of a shorter radius than 1000 feet. After passing the summit with the deep cut, before mentioned, of 50 feet, the grades become reduced to a maximum of 25 feet per mile, which they do not exceed in the passage of the line through Boonsborough and Hagerstown to the summit of the Salsbury ridge, dividing the waters of the Antietam from those of the Conecocheague, the minimum radius of curvature also remaining unaltered. From the summit at the head of Israel's creek to Boonsborough is about 7 miles, and the graduation is heavy—Thence to Hagerstown the distance is 11 miles, and the ground over which the line passes very uneven for a considerable part of the distance, especially about the Beaver creeks, the crossing of which will be very expensive. The line was so run as to pass immediately through both of the towns, principally along streets already located. From the summit of Salsbury ridge, about 3 miles west of Hagerstown, to the Conecocheague, a distance of about 6 miles, the line descends at a grade of 35 feet per mile, and thence to the Potomac, at the narrows of the North Mountain, a further distance of about 9 miles, it is conveyed at grades of 25 feet per mile and under, with a graduation of a character not very costly. The entire distance from the Potomac at the mouth of Israel's creek to the Potomac at the North Mountain, is 43 miles by the survey just described, for which entire distance the river is altogether avoided. The route then which the act of the legislature has indicated has been shewn to be maintainable at a certain expense of construction, and at the cost of certain disadvantages which will be made to appear in the following description of another route between the points upon the river now spoken of.

This route takes up the present road at the furthest point which it has reached, opposite Harper's Ferry, and continues it along the margin of the river on the inner border of the canal to the mouth of the Antietam, a distance of 8 miles—The graduation for that distance would be costly, only where the rail road must be supported contiguous to the canal by a wall, such as separates the two works at the narrow passes below—A wall would be needed for 4 of the 8 miles for which the rail road and canal would be in contact—From the mouth of Antietam the route, leaving the river, ascends the creek about 7 miles, with a line considerably curved, in some cases with a radius of about 600 feet, but with grades not exceeding 20 feet per mile, and a graduation not very expensive—It thence crosses the country a distance of 12 miles towards the Conecocheague, passing over the Salsbury

ridge, and falling into the Hagerstown route at the point where it crosses that stream, about 2 miles above Williamsport—The length of this line from Harper's Ferry to the narrows of the North Mountain is 36 miles, being 7 miles shorter than the distance from Weverton to the same point, by the Boonsborough and Hagerstown route—But as Harper's Ferry is 3 miles above Weverton, the distance from the latter to the North Mountain is 39 miles by the river route, which is therefore only 4 miles shorter than the other—Upon the two routes, however, the difference in the length of new railway to be made, will be 7 miles, increased by the distance of one mile and two-thirds, which will occur between Weverton and the point in the present railway down the river, from which the new track must take its departure, which will make the additional length of road required upon the Pleasant Valley route equal to eight and two third miles.

Tho two routes would be about equal in regard to curvature, but a considerabie superiority in respect to grade would belong to the river route, upon which it would not be necessary to employ a more rapid rate of ascent than 25 feet per mile, excepting perhaps, in ascending from the Antietam to the Salsbury ridge summit, where 50 feet per mile might be required for perhaps three miles, while upon the Pleasant Valley route the same ascent per mile would embrace a continued distance of about 9 miles. The absolute elevation surmounted upon the latter route will also probably amount to at least 300 feet more than upon the former, though we cannot at present institute an exact comparison between the two, as the survey of the river route was left incomplete by the breaking up, by sickness, of the party engaged in it.

The presence of the canal upon the river would certainly somewhat embarrass the rail road in its construction, and render it much more costly than if the ground were unoccupied by that work—Inasmuch, however, as the rail road, by means of the viaduct nearly finished at Harper's Ferry, will be connected at that place with the Virginia side ; it might be continued up the Potomac upon that shore to the mouth of Antietam, and there be made to recross the river upon another bridge, the cost of which might be much less than that of the walling required to sustain it along side of the canal. It would appear then, that upon either of the two routes which have been described, all collision with the canal may be avoided for the whole of the distance between Weverton or Harper's Ferry and the Narrows of the North Mountain.

Proceeding with the route up the Potomac from the latter point, we find the line remarkably direct for about 17 miles to Round Hill, 4 miles above Hancock with grades not exceeding about 20 feet per mile, and a graduation of rather moderate cost. For this entire distance there is no serious interference with the canal, the transverse slope being sufficiently gentle to allow of such a space between the two works as to render walling unnecessary; at about 7 miles below the town of Hancock, the rail road indeed encoun-

ters the turnpike, and is obliged to cross and recross it 4 or 5 times in as many miles. In keeping clear of the canal the location is thus embarrassed by coming in contact with another work which is however much more manageable, yet, in accommodating which, it is necessary to introduce frequent undulations in the grades. Round Hill is easily encircled by the line, which, after making another much more abrupt bend around a spur of Tonoloway hill, pursues a direct course to the mouth of Sideling hill creek 12 miles above Hancock. The cost of construction between Round hill and Sideling hill creek will be rather heavy, the grades which alternatively ascend and descend need not exceed 20 feet per mile, nor the radius of curvature be shorter than 1000 feet. For most of the distance the canal and rail road must be very near each other, but actually in contact at only a few places. From the North mountain up to this point, a distance of 26 miles, the facilities for the construction of both works upon the Maryland shore would seem to invite a continuation of the rail road upon that side of the river. At Sideling hill creek the character of the valley changes, the stream becoming much more serpentine and the hills which bound it more precipitous and rocky. There is no chance however of escaping from the immediate margin of the river till the mouth of Fifteen-mile-creek is reached, 4 miles above, and for the greatest part of that distance the rail road and canal must be in close contact, unless the former should escape the collision by a double crossing of the Potomac, one below the mouth of each creek, the advantage of which would be doubtful. Having thus been compelled for a distance of 30 miles to follow the river faithfully, there fortunately offers at the point now reached, an opportunity of taking leave of it and not returning to it until Old Town is reached, a distance of 20 miles, for the whole extent of which its valley is of the most sinuous and rugged character, so much so indeed that to pursue all its windings would more than double the distance without greatly diminishing the cost per mile of the construction. In tracing therefore the route by the river between the mouth of Fifteen mile creek and Old Town, so many bends of the river are cut off as to reduce the distance gained by the route across the country between the same points, to but half a mile. In effecting these frequent curtailments of the curvatures of the river, it is necessary to sustain high levels, ascending and descending continually at grades of from 25 to 50 feet per mile, and encountering very heavy embankments and deep cuttings or tunnels. It is through one of the elevated necks of land thus cut off, that the canal is conveyed by a tunnel of $\frac{1}{2}$ a mile in length. The elevated position upon the slopes which the rail road is obliged to take when following the course of the stream, in order to avail itself of the occasions which offer for deviating from the line of the canal which is compelled to adhere much more closely to the river, prevents so serious an interference between the two works, as would

happen if they were more nearly upon a level, yet there are still several points of contact between them, which would be the source of considerable difficulties in the construction of both. Under these circumstances, attendant upon a location of the road along the river between the points above mentioned, it is manifest that the cross cut route, though not gaining much in distance, must present strong claims to attention, and great interest was felt in its survey, which resulted in shewing a route entirely practicable, within the same limits of grade and curvature demanded by the river line. The cross cut route ascends the valley of Fifteen mile creek for about 6 miles in which distance that stream breaks through Town hill and Green Ridge, and is consequently very crooked and rocky, it thence passes up the ravine of Rock Lick Run, 4 miles more to the main divide, between the drains of Fifteen mile creek and Town creek. This ridge is here depressed in a remarkable manner, the pass which it offers at this place being probably 800 or 1000 feet lower than the adjacent elevation of the same range of hills on either side. From the summit which is reached with a grade of about 50 feet per mile, and passed by a practicable cut of 70 or 80 feet in depth, the line decends at the same grade to Town creek which it crosses, and thence after surmounting two snbordinate summits reaches the river valley at the village of Old Town, 2 miles above the south branch of the Potomac.

The cross cut route just described cannot be maintained without considerable cost of graduation and bridging, but in those particulars it will probably be less expensive than the route by the river. Enjoying then as it does some advantage in point of length and a great recommendation in its freedom from contact with the canal, its pretensions to preference are certainly not without weight; before however a proper comparison of the relative merits in all respects of these lines can be made, more minute surveys and calculations must be executed. From Old town to Cumberland the distance is 16 miles, for a considerable part of which the canal and rail road if located on the same side of the river, must be constructed side by side, at an increased cost to both, or at a greatly augmented expense to the rail road if independently located upon a level sufficiently high to make the points of collision but few in number. The rail road may however be placed on the Virginia shore, by crossing the North branch of Potomac, a short distance above its confluence with the South branch, at an advantageous site for a viaduct, and thence continuing on that shore for about 10 miles, of generally favourable ground, then recrossing the river and canal at a considerable bend of the stream, and thence again coming back to the Virginia side about 2 miles above, where the river returns from a circuit which it has made. The south margin may then be pursued to a point opposite Cumberland, where the river may be once more passed, either above or below the mouth of Wills' creek, and in a favourable direction for continuing its way up that valley in ascending the Alleghanies.

From the preceding description of the general characteristics of the route through the valley of the Potomac from near Harper's Ferry to Cumberland, the principle facts and conclusions may be thus concisely stated.

1. From the present termination of the rail road to the Narrows of the North Mountain, there are two feasible routes, one from Weverton by Pleasant valley, Boonsborough and Hagerstown, 43 miles in length, and avoiding the river, and consequently the canal for the whole distance—the other from Harper's Ferry by the vallies of the Potomac and Antietam, 36 miles in length, and avoiding a contact with the canal by the aid of a viaduct over the river at the mouth of Antietam.

2. From the Narrows of the North Mountain for a distance of 17 miles to a point 3 miles above Hancock, there is a favourable route along the Maryland shore of the river, without much embarrassment from the canal, and making questionable the expediency of crossing the river to avoid that work.

3. From the point last mentioned to the mouth of Fifteen mile creek, a distance of 13 miles the two works must be in frequent contact unless two or more crossings of the river by the rail road are resorted to, to prevent that result.

4. From the mouth of Fifteen mile creek to Old Town, there are two practicable routes of a nearly equal length of about 20 miles, the one by the river valley occasionally interfering with the canal, and the other by the drains of Fifteen mile and Town creeks, cutting across the country north of the river and keeping clear of the canal altogether.

5. From Old town to Cumbertand 16 miles, the route must confine itself to the river, but has its choice of the two sides alternately at its option, and if occupying the Maryland shore altogether, must be brought into numerous collisions with the canal.

The entire distance from Weverton to Cumberland by the Pleasant Valley route is 108¾ miles, and by the Antietam route 104½ miles.

The frequent crossings of the Potomac river which have been spoken of, may be considered objectionable on the score of expense. The bridges required will undoubtedly be somewhat expensive, although their cost will be much diminished as we ascend the river which from the South Branch upwards, (above which the more frequent and perhaps the only advisable crossings would take place,) becomes a stream of very inferior magnitude. Against the cost of these viaducts should be placed the great saving in expense of graduation arising from an uncontrolled command of the ground along the margin of the river, few of whose slopes are without sufficient room at their bases to admit the economical construction of a rail road alone, though too narrow to allow of its being cheaply built in conjunction with a canal. By taking by-turns either side of the Potomac, much curvature and distance would be saved, and greater facilities and inducements afforded

for the construction of Branch roads leading up the numerous fertile vallies, as many of which pour their tributary waters into their parent stream from the territories of Virginia upon the right hand, as from those of Maryland and Pennsylvania upon the left. No part of the Virginia shore having been as yet actually surveyed, the opinions expressed with reference to the probable advantage of its occasional occupation by the route, depend for their confirmation upon the surveys proposed to be made, as soon as that region becomes healthy, under the direction of the Chief Engineer as commissioner on behalf of the rail road company, to act in conjunction with a like officer on the part of the canal company, in determining the number and extent of the places at which the two works must be brought into contact.

The surveys which have been made in the valley of the Potomac, with their satisfactory results having been now described, I proceed to report the still more interesting and equally encouraging information derived from the operations of the parties acting under my direction in the mountains.

In the summer of 1835, an examination of the part of the Alleghany region in question, was made by the chief engineer, in whose able report appended to the ninth annual report of the President and Directors, upon his general reconnoissance from Cumberland to Wheeling and Pittsburg, all the principal routes were described which offered apparently feasible modes of crossing the main divide between the eastern waters of the Potomac and the western streams of the Youhiogany and Casselman's rivers. His examination of the district embracing the drains of those water courses, heading in the elevated country to be crossed, had been so careful as to leave me but little more to do than to direct the instrumental survey of the routes indicated in his report, and the projection of several of which exhibited the high professional ability of that officer, and his clear discernment of the relative advantages of the various locations offered by a of region singularly perplexed topography. So particular has been his description in the report alluded to, of the several practicable lines over the summit between Cumberland and the confluence of the Youhiogany and Casselman's rivers, that I shall speak of those lines as routes whose general features are already known, under the following numbers and designations contained in the general synopsis of routes in page 62 of that report.

1st. The route by the north branch of Potomac, Savage, Crab Tree, Deep Creek, Bear Creek, and Youhiogany river.

2d. The route by Wills Creek, Bowmans, Flaugherty Creek and Casselman's River.

3d. The route by Wills Creek, Jenning's Run, Albright's, Flaugherty and Casselman's, *with a Tunnel.*

4th. The route by Jenning's or Braddock's Run, Cranberry Swamp, Flaugherty and Casselman's rivers.

5th. The route by Braddock's and Jenning's run, Vaughan's, Beall's tavern, Flaugherty and Casselman's, *with a tunnel.*

6th. The route by Wills' Creek, Laurel Run, Albright's, Flaugherty and Casselman's, maximum grade 50 feet per mile.

The practicability of crossing the Alleghany mountains, with a grade not exceeding 50 feet per mile, which is suggested in the description of the 6th route, was an idea, which startled by its novelty, and warred so much against all existing conceptions of the great height and rugged wildness of that elevated chain, that it was thought too flattering to be true—Yet its *theoretical* feasibility was, from the first, not to be questioned; as the altitude of the summit to be passed, as well as the distance between it and Cumberland, having been positively ascertained by the surveys of the Board of Internal Improvement, the height and length of the plane of acclivity were known, and consequently also its angle of inclination—There was, nevertheless, so much doubt in regard to its *practical* feasibility, on the score of the expense which the maintenance of that grade would involve, that the determination of the latter question became an immediate object of great solicitude, and accordingly the instrumental survey of the proposed line was commenced at the same time with those upon the Potomac. The brigade to which this duty was assigned, began its survey at the summit at Albright's, and traced the assumed grade of 50 feet per mile, down the ravine of Laurel Run to Wills' Creek, and thence by the valley of that creek to Cumberland—In sustaining a uniform rate of descent along a water course, falling with every variety of declivity, and for several miles from its head with nearly three times the rapidity of the grade, the position of the line upon the side slopes of the ravine became more and more elevated until at the mouth of Laurel Run, whose fall is about 140 feet per mile, it had reached a height of upwards of 400 feet above the bed of that stream at its junction with Will's creek. In the descent of Laurel Run, whose course is very direct, and whose lateral tributaries are inconsiderable, it was not practicable to add to the length of the line so as to augment much its absolute descent. Upon arriving at the valley of Wills' creek, whose slopes are more indented by side drains, opportunities offered of extending the distance of the route, and after passing round the end of little Savage mountain, the glen of Savage run, which forms a deep hollow between great and little Savage, afforded the means of prolonging the line by ascending and descending that run upon its opposite sides. The route then encircled the end of great Savage, and soon after encountered the vale of Clites' run, which presented another opportunity of losing distance. Glattens run was next reached, and aided also in increasing the length of the route, which, by its prolongation and the preservation of its uniform rate of descent, was at last brought down, at the mouth of Jennings' run, to the bottom lands of Wills' creek, the moderate fall of whose water it thence pursues to Cumberland. In the execution of this important survey which has very recently been finished, the difficulties

encountered have been so numerous and considerable, as very very much to postpone its completion. Over a surface of more rugged character few experimental lines of equal length have been carried. To obtain even a mere approximation to the proper position of the line, frequent corrections of lines previously run had to be made, and much would have still to be done in the precise staking out of it for construction, were that in contemplation. The distance upon it from Cumberland to the summit between the Eastern and Western waters at Allbright's will be 37 miles. The height of that summit above the level of the Potomac at Cumberland is 1846 feet. Reducing the natural summit by a cut of 70 feet, (which cannot be made deeper as the adjacent waters of Flaugherty are but 77 feet below it,) and placing the line at Cumberland say 16 feet above the river, the elevation to be overcome is 1760 feet, occupying $35\frac{1}{4}$ miles of distance at a grade of 50 feet per mile, and leaving $1\frac{3}{4}$ miles of additional distance to be used in such modificatious of that grade as might be advantageous upon a location. The curvatures of this line are frequent—it is indeed a continued serpentine meandering of the hill sides for almost the entire distance, and so narrow are the mountain spurs and hollows, that a radius of 400 feet does not afford sufficient abruptness of deflection to accommodate their slopes, and deep and constant cutting and filling is still required leading to heavy expense in the graduation and bridging. To determine however satisfactorily the question, whether the great costliness of this route would more than balance the signal advantages attendant upon the moderate acclivity of its grade, a most careful and elaborate location, and calculations of corresponding precision must be made. All that can at present be said in regard to it, is that it is not positively impracticable.

Happily, however, the question, whether the Alleghanies can be crossed by grades suited to the capacity of the locomotive engine, does not depend upon the feasibility of the route just described, as will be shewn in the subsequent description of the other lines of ascent from Cumberland to the summit, which are designated in the list of routes above referred to, and which I will proceed severally to consider.

The first route by the Potomac, Savage river, Deep Creek, the Youhiogany, &c. has not yet been surveyed, and no further knowledge of its character can be communicated than that which is conveyed in the account of its examination by the chief engineer.

The fourth route by Jenning's or Braddock's run, the Cranberry swamp, &c. has been surveyed so far as to evince its decided inferiority in point of length and elevation of summit to other routes with similar limitations of grade and curvature.

The fifth route by Vaughan's saw mill and Beall's tavern, &c., *with a tunnel,* has not been traced, but has been seen, through the

results of the other surveys, to offer no inducements to its further examination.

The third route by Will's creek, Jenning's run, Allbright's, Flaugherty and Casselman's, *with a tunnel* has been surveyed, and with the following favorable results.

Those who have perused the report of Mr. Knight, with the aid of its illustrative map, are aware that the true divide between the drains of Will's creek on the east, and those of Casselman's river on the west side of the summit, is a subordinate ridge running in a transverse direction from the great Savage to the great Alleghany mountain, the former of which to the north east of this ridge is broken by Will's creek, and the latter to the south west of it, is cleft through by Flaugherty creek. This main divide must be crossed at all events, but there is no absolute physical necessity of passing through either of the mountains which it unites. Thus the sixth route which I have particularly described, owes its moderate grade of 50 feet per mile and its freedom from a tunnel, to its avoiding an encounter of the great Savage by passing around it through the Will's creek gap, through which gap also passes the second route by Bowmans, &c., hereafter to be noticed. The route however now under description, with a view to obtain a shorter line than either of those just named, in descending eastward from the summit of the main ridge at Allbright's, reduced by a cut of 50 feet, crosses Laurel run 20 feet above its surface, instead of turning down its ravine, and pierces the great Savage by a tunnel passing 375 feet below its crest. The distance from the summit to the west end of the tunnel is $1\frac{1}{2}$ miles, and the length of the tunnel something short of $\frac{3}{4}$ of a mile; the mountain at this point being much narrower than its usual breadth at a similar distance from the top. The location of the proposed tunnel is remarkably favorable. The material met in the excavation may probably prove a sandstone of moderate hardness, easily removed, and yet sufficiently compact to form a permanent natural arching—unsupported by masonry. Upon emerging from the tunnel on the east slope of the mountain, two routes present themselves, whose feasibility has been established by survey. One of them turning to the south, the other to the north in the descent of the mountain side. Both of these lines descend from the summit to this point at grades of from 40 to 50 feet per mile, and both, in descending thence towards Will's creek, assume a grade of 92 feet per mile. The line turning to the south pursues the mountain side in a generally direct though meandering course for about 8 miles, until within about a mile of the village of Frostburg, upon the National road, it turns around and crosses the principal drain of Jenning's run, heading in the ridge on which Frostburg stands, and which divides that run from George's creek. The course of the line having been up to this point nearly south, and laying upon the eastern slopes of the Savage mountain, becomes after passing the head of Jenning's run, nearly north

east, and occupies the western side and spurs of Dan's mountain, along which it winds, until turning to the eastward it makes its way through the gap of that mountain, broken through by Jenning's run, and reaches the valley of Wil.'s creek at the mouth of that stream and at an elevation of 120 feet above its level. From thence it descends, by a grade diminished to about 50 feet per mile, along the creek to Braddock's run, which, as well as the new National road, it crosses, and continues through the narrows of Will's mountain to the town of Cumberland.

This line corresponds nearly with the part east of the summit of that route described by the Chief Engineer in page 55 of his report as being the shortest which can be obtained without increasing grade or expense beyond proper limits. By it the distance between Cumberland and the summit at Allbright's is $22\frac{3}{5}$ miles, of which $17\frac{1}{5}$ miles is at the extreme grade of 92 feet per mile, and the remaining 5 miles at grades of 53 feet per mile and under. It is therefore shorter than the route by Will's creek and Laurel run between the same points with a uniform grade of 50 feet per mile by $14\frac{2}{5}$ miles. The difficulties to be encountered in the graduation of this, the shortest practicable route are formidable at only a few points. The part of it between the east end of the Tunnel and the head of Jenning's run opposite Frostburgh, a distance of 8 miles, principally consists of a moderate side cutting, and such with the exceptions of a few deep yet short cuttings and fillings continues to be the character of the grading for a further distance of 5 miles, after which, and especially through the break in Dan's mountain, the work becomes considerably more expensive, yet still within not unreasonable limits. It is believed however that not taking the tunnel into account, the route now in question would cost much less *per mile* than the longer one with the gentler grade, and it is thought not unlikely that the difference of expense between the two would more than compensate for the great and somewhat contingent cost of the tunnel. The route now spoken of in descending the valley lying between Savage and Dan's mountains, has for one half the distance a southern exposure, and passes through a well cultivated district abounding in the fine bituminous coal of that region.

The other branch of the tunnel route turning to the north from its east end remains to be described. This line descends along the slope of the great Savage to the ridge dividing the waters of Jennings' run from those of Glattens' run, a tributary of Will's creek not much inferior to Jennings' run in importance. That ridge was found too low to support the line upon, which was thus compelled to pass over upon the drains of Glattens' run, returning to the mountain side and following it down towards the mouth of that run which it reached in a distance of 17 miles from the tunnel. The grade of 92 feet per mile employed also upon this route, brought it down at the mouth of Glatten's run to the bottom lands of Wills' creek which it thence pursued to Cumberland with a

line of easy grades and remarkable directness and cheapness of graduation.

The proposed tunnel, though common to both the routes now under consideration and of nearly the same length for either, has a somewhat different position for each, in order to facilitate the turn which must be made in opposite directions for the two routes in starting down the mountain side. Upon the route by Glatten's run, as also upon that by Jennings' run, the distance from the summit at Allbright's to the east end of the tunnel is $1\frac{7}{8}$ miles, and the descent from 40 to 53 feet per mile—thence to the end of the 92 feet grade at the mouth of Glatten's run, the distance is 17 miles and thence to Cumberland $7\frac{3}{4}$ miles, at grades of 25 feet per mile and under, making a total distance from the summit at Allbright's to Cumberland of $26\frac{2}{3}$ miles, greater by $4\frac{1}{3}$ miles than the length of the route by Jennings' run between the same points. In cost of graduation the difference between these two lines would not probably be considerable, as they pass over very similar ground during their descent of the mountain slopes, and the whole of the additional length of the Glatten's run route is upon a smooth bottom land. The latter line would enjoy a southern exposure for a much greater proportion of its length than the former, and would pass through a country equally well cultivated, but the coal mines of which have not yet been so extensively opened.

The preceding description of the two routes connected with a tunnel through the great Savage mountain, exibits the gain in distance that would attend the adoption of a grade of 92 feet per mile in preference to one of 50 feet per mile, as well as the probability that the diminished expense at which the steeper grade could be maintained along the mountain slopes would more than counterbalance the additional cost of the proposed tunnel. As the objections against a work of this kind usually arise as much from the delay as the expense attendant upon its construction, it was deemed proper to ascertain whether, in case one of the tunnel routes were adopted, there could be found a way of passing over the mountain which it was designed to perforate, by a track to be used during the progress of the subterranean excavations. A route was accordingly discovered passing over the summit of the great Savage at a depression about two miles north of the tunnel, with grades of 92 feet per mile, and an increased distance of about four miles, and admitting of a location upon easy ground.

The longest and the shortest lines ascending from Cumberland to the summit have now been described. The route intermediate to these, both in length and in inclination of grade, remaining to be noticed is the 2d in the preceding synopsis of Mr. Knight, viz. "by Wills' creek, Bowman's, Flaugherty creek and Casselman's River." The survey of this line has been but recently entered upon, but has progressed far enough to show a promise of favorble results. In order to exhibit precisely the relative heights of the several passes in the main divide between the great Savage and

great Alleghany, a careful survey was made of the whole length of that ridge which shewed that the two deepest depressions in it were the one at Allbright's already often adverted to, and the one at a point described in Mr. Knight's report as being "three fourths of a mile south of Absalom Baer's." The level of the latter was found to be the lowest by about 12 feet. It is known in the neighborhood by the name of the "Sand Patch" and from it upon either hand the ground declines rapidly, on the eastward to a drain of Scaffold Camp run, and on the westward to a tributary of Flaugherty creek. At this spot the route in question as now traced is made to pass the ridge by a cut of 50 feet in depth. It then descends eastward from the summit at a grade of 92 feet per mile for about three miles, when it crosses the Scaffold Camp run with a filing of 24 feet, and in about a mile more comes down to the level of the bottom land of Wills' creek at Bowman's saw mill, a little below the mouth of the run just named. From this point the route pursues the fall of the waters of Wills' creek, with grades of various declivity but not necessarily exceeding 66 feet per mile. If the summit at the "Sand Patch" were reduced 50 feet more by consenting to a short tunnel, this grade of 66 feet per mile, might probably be maintained throughout the whole of this route as the maximum plane of ascent, the advantage attendant upon the observance of which limit of grade would be that upon it the auxiliary power of *one* additional engine per train would suffice for the purposes of transportation.

The surveys of which the preceding account is given and which have demonstrated the feasibility of no less than four routes from Cumberland to the summit, have not yet been extended westward of that summit sufficiently far to enable me to report any further results. Examinations have however been made beyond the dividing ridge, which with the aid of the levels determined by the canal surveys, exhibit the undoubted practicability of the descent with a grade not exceeding 66 feet per mile by Flaugherty's creek, through the gap in the great Alleghany or Meadow mountain to the Casselman's river, the valley of which offers every facility for the further extension of the road towards its destination.

The difficulties to be encountered in crossing the Alleghany range lie indeed, as is well known, chiefly upon their eastern side, on account of the far greater rapidity of the fall of its waters from the dividing ridge towards the Potomac, then towards the Monongahela.

In illustration of the surveys which I have endeavoured to describe, but of which a delineation on paper can alone convey a clear understanding, a reduced general map is now in preparation.

The several brigades of Messrs. Steele, Swann, Morris and Hazlehurst have performed their duties with zeal and efficiency under the direction of the very competent officers placed at their

heads. The services of the party of Mr. Swann have been confined entirely to the mountain country, it has been by this party that the line of 50 feet grade was run, and it is now engaged in a resurvey of a portion of that route with a view to a modification of that grade for the saving of expense in construction. Messrs. Morris and Hazlehurst were employed up to the middle of July upon the Potomac, and the surveys from the North mountain to Cumberland were their joint work, since which the former has traced the line over the great Savage by the Cranberry Swamp, the line along the top of the main divide and the tunnel route by Jennings' run, and is now engaged in running a line westward from the summit at the "Sand Patch" down Flaugherty creek; while the latter has surveyed the tunnel route by Glatten's run and the route over the top of Savage proposed to be used while the tunnel should be in progress, and is now employed in running a line eastward from the summit just named, down the Scaffold Camp run.

John D. Steele, Jr. whose party was dispersed by sickness, when his survey of the Antietam route, from Harper's Ferry to the North Mountain, was within a week of completion, after the recovery of his health and that of his assistants, was sent to Parr's Spring Ridge, to determine by survey the feasibility of relocating the rail road, so as to cross it with a grade not exceeding about 92 feet to the mile, in place of the present planes which, though they have been passed with light loads by the Locomotive engines of the company, are yet much too steep for the advantageous and constant use of that description of power. This survey has been carried far enough to show the perfect practicability of obtaining at a reasonable expense of construction a new line over the ridge with the desired limit of grade.

The design of this report being simply to present a statement of the facts developed by the surveys up to the present stage of their progress, I will not further extend its already considerable length by the addition of observations of a theoretical character naturally suggested by the facts detailed, but with your permission respectfully to submit the foregoing, I remain

Your most obedient servant,

BENJ. H. LATROBE,

Engineer of Location.

[C.]

SUMMARY STATEMENT

OF THE AFFAIRS OF THE

BALTIMORE AND OHIO RAIL ROAD COMPANY,

October 1st, 1836.

The Company have received for stock, -		$3,250,050 00
And for balance of the million loan to pay for the stock held by the Main Stem in the Washington branch, but not required for that purpose, owing to individual subscriptions to this amount, -		61,200 00
Making together, - - -		$3,311,250 00
And they have expended on account of the construction of the road, including real estate and depots, locomotive steam power, burden and passenger cars, horses, mules and harness, and an item of $43,115 14, called "deferred interest,"		3,474,600 08
Which shows an over-expenditure of the capital of		$163,350 08
The Company have received for revenue (including $29,942 69, from the eight miles used by the Washington branch) for the year ending 30th September, 1836, - - - - -		$281,966 87
And they have expended in transportation expenses, - -	$128,177 41	
Repairs of the road, - -	53,101 32	
Repairs of the machinery and cars,	26,514 12	
Office expenses, salaries, &c. -	5,011 83	

Which shows the actual expenses incident to the working of the road for the year ending 30th September, 1836, to have been - -		212,804 68
And that the actual earnings of the road for the same period were, - - - - -		69,162 19
There have been paid in interest as follows, viz: to E. Strahan, on anticipated instalments on three shares of stock returned him, -	$9 15	
To the State and city, on $250,000 anticipated instalments, -	12,500 00	
Rent of lot at City Block, -	100 00	
Ground rent to Robert Miller's estate,	1,802 43	
Interest on advances by the Mechanics' Bank, -	2,000 00	
Discount on bills payable $120,000,	2,786 67	
Interest on the $61,200, balance of the million loan, -	3,672 00	
Shewing the amount charged to interest account, independently of the $938,800 stock in the Washington Branch road to be, - -		22,870 25
And that the nett revenue is, - -		$46,291 94

This is supposing the lateral branch road to Washington to be able to take care of itself by yielding dividends of six per cent. per annum to its stockholders, and thereby paying the interest on the money which the main stem has borrowed, and invested in the stock of the branch road. But, as the dividend of the profits of the branch up to the 30th September, 1836, could not well exceed five per cent. as is hereafter shown—the account stands thus:

Nett revenue of the main stem independently of the branch, - -		$46,291 94
Interest on $938,800, amount of stock in the Washington branch road, - -	$56,328 00	
From which is to be taken the probable dividend of the branch road, -	46,940 00	
Which shews that the main stem would lose this year by its investment, were it not for the income from the eight miles of road, $29,942 69, which makes the branch road a source of nett profit to the main stem of $20,554 69,		9,388 00
The nett revenue is, therefore, only -		$36,903 94

Secondly,—

As to the Washington Branch, which has stock,		$1,500,000 00
And there have been expended in making the road, and in real estate and depots, locomotive steam power, burden and passenger cars,	$1,547,416 93	
In Interest, - - - - -	16,482 68	
And in an annuity for the Elkridge landing bridge of $1,250 at 5 per cent, - - - - - -	25,000 00	
Making in all, - - -		$1,588,899 61
Making the over-expenditure of the capital,		$ 88,899 61
The revenue from this branch up to 30th Sept. '36, has been - - - - - - - -		$178,333 95
Out of which the following expenses have been paid, viz:		
Bonus to the State, being one-fifth of the receipts for passengers, - -	$40,564 26	
Expenses of transportation, - -	26,540 47	
Repairs of the road, - - - -	5,423 17	
Repairs of the machinery and cars, -	11,238 23	
Office expenses, salaries, &c. - -	4,795 79	
Interest, (annuity for Elkridge landing bridge, $250 not yet called for,)	1,000 00	
Making in all, - - - -		$89,561 92
And leaving the net revenue, - - - -		$88,772 03

A dividend of 5 per cent could be made with $75,000, and leave a surplus of $13,772 03 to cover the wear and tear of the road, machinery, &c.

Now, it has been shewn that the over-expenditure of the capital of the main stem amounts to		$163,350 08
And that of the capital of the Washington branch to		88,899 61
Making together, - - - - - -		$252,249 69
And that the revenue of the main stem is - - - - - -	$36,903 94	
And that of the Washington branch, - - $88,772 03		
Less am't of probable dividend to the main stem, 46,940 00		
	$41,832 03	
		$78,735 97
Shewing the aggregate debt of the company to be,		$173,513 72

This account does not include the instalments of $5 per share now called for, half of which is payable on the 30th inst. and the residue on the 30th of next month, (November.) There is already paid $22,647 46.

The Company have bills payable out amounting to	$120,000 00
The annuity for Elkridge landing Bridge, - -	25,000 00
And they owe the advances of the Mechanics' Bank,	28,513 72
	$173,513 72

It will be proper to remark, that the foregoing statement is an approximate estimate of the present situation of the company, and may not be strictly accurate, but it certainly comes within two or three thousand dollars. The accounts for the quarter ending 30th September, 1836, not having yet been furnished by the different Superintendents, some parts of the statement are made from estimates.

J. I. ATKINSON, *Secretary.*

(C.)

BALTIMORE AND OHIO RAIL ROAD OFFICE,
1st October, 1836.

J. W. PATTERSON, Esq.
President Baltimore and Ohio Rail Road Company.

SIR:—I have the honor to enclose herewith tabular statements of the operations of the Main stem, and Washington branch of the Baltimore and Ohio Rail Road, for the year ending 30th September, 1836.

The tables numbered from 1 to 5 inclusive, relate to the main stem, and show the aggregate receipts from that road to have been $281,312 $\frac{53}{100}$, of which the sum of $128,126 $\frac{30}{100}$ was the revenue from passengers, and 153, 186$\frac{23}{100}$ the revenue from tonnage. It is proper here to remark, that there is included in this aggregate the sum of $30,350 $\frac{27}{100}$, received from the Washington branch for the use of eight miles of the main stem, that are common to both roads, so that in fact the aggregate revenue of the main stem proper, is but $250,962 $\frac{26}{100}$. The receipts from the main stem for the preceding year, ending September 30th, 1835, from all sources, amounted to $263,368 $\frac{10}{100}$, of which $5,718 $\frac{20}{100}$ was received from the eight miles used by the travel and transportation to Washington; making the revenue from the main stem proper for that year $257,649 $\frac{90}{100}$, showing a falling off in the revenue of the main stem proper, for the year ending 30th September, of $6,687 $\frac{64}{100}$. In accounting for this it may be stated, that the flour transported on the road, in the year just ended, was less by 93,519 barrels than the flour transported in the year ending 30th September, 1835, which would much more than account for the difference in the receipts of the two years. It is only to be expected that the deficiency in the wheat crop of the country generally, will make a still further diminution in the quantity of flour transported during the present year.

The general expenditures of the main stem as shown by table No. 4, exceed those of the preceding year by $56,632 $\frac{46}{100}$, this difference is chiefly caused by the increased expense on account of repairs of rail-way. Nor from the character of the materials of which the rail-way is constructed, can it be anticipated that the expense of repairs for the current year will be diminished. In many places, on the line of the main stem, necessity seems to have compelled the use of sleepers, just taken from the woods, and string pieces of oak, newly cut; and as horse power was employed, the space between the rails had been filled up with earth to their tops nearly, and entirely covering the sleepers, where the timber used was green; these causes which could not be avoided, rapidly accelerated its decay, and even where cedar and locust sleepers, and heart pine string pieces were used, the

earth and gravel by which they were entirely, or in part covered, by keeping them constantly wet or damp, hastened their destruction.

Whenever steam shall be used exclusively on the road, the sleepers and string pieces, particularly the latter, will be left exposed in a great degree to the action of the air, and it may reasonably be supposed will be found more lasting than heretofore. Another cause of injury to the superstructure of the road has resulted from the use of burden wagons without springs since the introduction of steam power for the transportation of tonnage during the last year. While horses and mules were employed at a speed of 2 to 2½ miles an hour, the want of springs was not seriously felt: but when the trains came to be drawn by steam at the rate of six miles per hour, the wooden structure was sensibly affected by the jar of the heavy and unyielding loads that passed rapidly over it. All the cars recently built for tonage are provided with springs, and it is proposed by degrees to supply with springs all the cars used on the road.

The speed of rail road conveyance is its distinguishing recommendation, and with proper springs to the burden cars, the transportation of tonnage in perfect safety may be made, if necessary, to keep pace with that of passengers.

A heavy item in the cost of working the main stem, is that occasioned by the inclined planes at Parr's ridge, the average of which, per annum, taking the months of July, August and September, 1836, is $\$17{,}243\frac{14}{100}$, but considering the increased occasional expense in winter, may be more safely estimated with the *present* business of the company, at $\$20{,}000$ per annum. Should the road be re-located at this place, so as to permit the use of steam across the ridge, as proposed by the board, this entire item in the expense of transportation would be saved.

A reduction in the expense of working the road is anticipated during the current year, from the more extensive employment of steam in transportation. There are now eleven first rate engines in use on the main stem and the Washington branch, and their excellence may be well illustrated by the fact that the whole number are often at work at the same time, not one being under repair. The average number in constant use are *nine*—a proportion it is believed, not attained on any other known rail road. Their power may be appreciated by their ordinary load, which is five and sometimes six double, or eight wheel, cars, weighing when loaded *twelve* tons each; ascending with this load, grades ranging from level to 45 feet per *mile*, at from 6 to 8 miles per hour. It is expected that six additional engines will be put upon the road during the current year, which will it is believed be sufficient with those already in use, to work the road without the assistance of horse power.

A further reduction in the expense of working the road to Harpers' Ferry will be effected, it is supposed in a short time, when the restriction preventing the use of steam above the Point of

Rocks shall be removed, and the horse power now maintained there, is reduced in consequence.

In accordance with a resolution of the board of directors, instructions have been given to commence charging the additional cent per mile on passengers on the main stem, authorised by the late act of the extra session of the legislature. Had this been charged during the year ending 30th September last, the receipts from passengers instead of being but $128,126 $\frac{30}{100}$, would have amounted to $161,737 $\frac{44}{100}$.

Tables from 6 to 8 inclusive, exhibit the operations of the Washington road, on which the receipts from passengers have amounted for the year ending 30th September, to $176,149 $\frac{07}{100}$, and from tonage to $11,563 $\frac{53}{100}$. The severe winter of 1835–36, and the constant rains of the following spring, caused many and very heavy slips in the cuts on this road, which for a time threatened an entire stoppage of the travel. It is gratifying to be able to state, however, that neither on the branch road, nor on the main stem, was there a single trip lost by the passenger trains during the year.

The branch road at this time is in good travelling order; but from the nature of the soil through which it passes, slips may be still anticipated, and will continue to occur, until the sides of the cuts acquire a slope at which the nature of the soil will permit them to stand.

The nett receipts of the Washington branch, as will be seen by reference to table No. 8, amount to $75,895 $\frac{09}{100}$, or five per cent. on the capital stock; add to this the receipt by the main stem from that portion common to both roads, $30,350 $\frac{27}{100}$, and it will be seen that the Washington road has, during the past year, netted to the main stem 8 per cent. upon the capital of $1,000,000 invested by it therein.

The means of transportation at present on both roads, are as follows:

11 first rate locomotive engines, 9 of them in constant use.
1 second rate do.
980 4 wheel burden cars.
82 8 wheel do.
27 8 wheel passenger cars.
19 4 wheel do.
78 passenger horses—of which 25 are employed in the streets of Baltimore, and 19 at the inclined planes, the residue at different points on the road.
95 tonnage horses—27 of which are at work in the streets of Baltimore, 28 on the road east of Planes, and 8 west of Planes.
60 mules—16 of which are at work on road east of planes, and 14 west of planes.

Respectfuly submitted,

H. W. FITZHUGH,
Superintendent B. & O. R. R.

(C. No. 1.)

STATEMENT OF REVENUE

Received from the transportation of Passengers on the Baltimore and Ohio Rail Road from the undermentioned places respectively, from the 1st of October, 1835, to the 30th September, 1836, inclusive, viz:

During the month of	BALTIMORE.		Received from Wash'tn Branch for 8 miles common to both roads	ELLICOTT'S MILLS.		FREDERICK.		HARPER'S FERRY.		TOTAL.	
	Passengers.	Amount.		Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.	Passengers.	Amount.
1835.											
October, .	9,375	$4,330 38	$2,392 26	1,645	$657 46	1,442	$2,250 51	886	$1,490 14	13,328	$11,120 75
November, .	6,743	3,278 91	1,716 02	1,444	532 76	1,165	1,822 87	627	1,005 72	9,979	8,356 28
December, .	7,061	2,732 41	1,931 76	1,407	547 55	1,009	1,819 28	827	1,255 24	10,304	8,286 24
January, 1836.	5,988	2,002 50	1,573 02	1,027	380 49	1,025	1,980 56	604	863 34	8,644	6,799 91
February, .	5,020	1,703 89	1,046 64	695	261 88	633	1,231 17	434	599 08	6,782	4,842 66
March, . .	8,482	3,703 66	1,829 70	1,073	393 56	1,197	2,298 88	731	1,218 76	11,483	9,444 56
April, . .	10,352	4,318 21	2,898 72	1,269	473 38	1,289	2,404 16	1,039	1,661 04	13,949	11,755 51
May, . . .	11,729	4,336 15	3,355 48	1,747	596 84	1,328	2,325 72	1,179	1,714 34	15,983	12,328 53
June, . .	10,246	3,960 56	2,783 76	1,533	556 49	1,353	2,495 05	1,012	1,515 77	14,144	11,311 63
July, . . .	13,162	6,237 16	2,690 10	3,045	1,004 00	1,720	3,034 32	1,550	2,184 34	19,477	15,149 92
August, . .	11,769	5,682 04	2,344 19	1,879	704 12	1,835	3,362 64	1,663	2,650 29	17,146	14,743 28
September, .	11,210	5,418 41	2,731 21	1,544	563 54	1,561	2,920 39	1,568	2,353 48	15,883	13,987 03
	111,137	$47,704 28	$27,292 86	18,308	$6672 07	15,557	$27,945 55	12,100	$18,511 54	157,102	$128,126 30

(C. No. 2.)

STATEMENT OF REVENUE

Received from the transportation of tonnage on the Baltimore and Ohio Rail Road, from the 1st of October, 1835, to the 30th of September, 1836, inclusive, viz:

During the month of	WESTWARDLY.		EASTWARDLY.		Amount recv'd from Washn'tn Branch for transportation of tonnage on 8 miles common to both roads.	TOTAL.	
	Tonnage.	Amount.	Tonnage.	Amount.		Tonnage.	Amount.
October,	3374.17.0.1	$8,912 16	4836.19.3.3	$9,403 40	8 02	8211.17.0.0	$18,323 58
November,	2123. 5.3.0	5,342 30	4076.19.3.0	7,931 47	14 62	6200. 5.2.0	13,289 39
December,	2105. 4.2.1	4,760 57	3542.14.2.1	7,984 19	42 62	5647.19.0.2	12,787 38
January,	936.16.3.0	2,133 34	2365. 8.0.0	5,401 64	82 30	3302. 4.3.0	7,617 28
February,	1125.10.1.2	2,757 32	2297. 5.0.3	5,945 34	177 73	3422.15.2.1	8,880 39
March,	2432.19.3.1	5,262 76	4246.13.0.1	9,196 54	406 51	6679.12.3.2	14,865 81
April,	3306. 2.3.0	9,191 22	3712. 9.0.3	8,112 95	347 81	7018.11.3.2	17,650 98
May,	2704. 3.2.3	6,880 77	4288.16.0.3	9,339 10	378 36	6992.19.3.2	16,598 23
June,	1572. 9.1.0	4,457 38	2565. 1.0.0	4,071 93	370 15	4137.10.1.0	8,899 46
July,	1907. 3.3.0	4,892 90	2699. 7.2.0	5,186 36	362 00	4606.11.1.0	10,441 26
August,	2085.10.3.0	6,430 36	3067. 5.0.1	5,473 15	390 92	5152.15.3.1	12,294 43
September,	2224. 0.3.0	6,120 12	3106. 4.1.2	4,941 55	476 37	5330. 5.0.2	11,538 04
	25,898. 5.1.0	$67,141 20	40,805. 3.3.1	$82,987 62	$3,057 41	66,703. 9.0.1	$153,186 23

(C. No. 3.)

STATEMENT

Of the aggregate Revenue received on the Baltimore and Ohio Rail Road, from the 1st October, 1835, to the 30th of September, 1836, viz:

During the Month of	FROM PASSENGERS.		FROM TONNAGE.		TOTAL.
	Passengers.	Amount.	Tons.	Amount.	
October,	13,328	11,120 75	8211.17.0.0	18,323 58	$29,444 33
November,	9,979	8,356 28	6200. 5.2.0	13,289 39	21,645 67
December,	10,304	8,286 24	5647.19.0.2	12,787 38	21,073 62
January,	8,644	6,799 91	3302. 4.3.0	7,617 28	14,417 19
February,	6,782	4,842 66	3422.15.2.1	8,880 39	13,723 05
March,	11,483	9,444 56	6679.12.3.2	14,865 81	24,310 37
April,	13,949	11,755 51	7018.11.3.3	17,650 98	29,406 49
May,	15,983	12,328 53	6992.19.3.2	16,598 23	28,926 76
June,	14,144	11,311 63	4137.10.1.0	8,899 46	20,211 09
July,	19,477	15,149 92	4606.11.1.0	10,441 26	25,591 18
August,	17,146	14,743 28	5152.15.3.1	12,294 43	27,037 71
September,	15,883	13,987 03	5330. 5.0.2	11,538 04	25,525 07
	157,102	$128,126 30	66703. 9.0.1	$153,186 23	$281,312 53

RECAPITULATION.

Transportation,	157,102 Passengers.	Revenue	$128,126 30 (*a*)
"	66,703.9.0.1 Tons.		153,186 23 (*b*)
Total, - - - - - - - - - - - - - - -			$281,312 53

(*a*) This includes $27,292 received from the Washington Branch for the 8 miles common to both roads, as per table No. 1.

(*b*) This includes $3,057 41 received from the same as per table No. 2.

(C. No. 4.)

STATEMENT

Of the Expenses incurred in working the Baltimore and Ohio Rail Road, (main stem) for the official year ending the 30th September, 1836.

Item 1*st. Expenses of Transportation*—including maintenance, shoeing and attendance on the stock—the expense of working the rail-way in the streets and at the inclined planes—the salaries of depot agents, conductors, engine men, firemen, and laborers—the cost of coal, &c., for the use of the locomotive engines, and contingencies, - -	$128,030 05
Item 2*d. Repairs of Rail-way*—Including the cost, inspection, and handling of materials for the renewal of the track—the pay of supervisors, carpenters, stone cutters, and laborers —and the repairs of tools and contingencies, - - -	52,862 01
Item 3*d. Expenses of Machinery*—Including the repairs of wagons, coaches, locomotives and tenders, and contingencies, per returns of the superintendent of machinery, - -	26,871 40
	$207,763 49

(C. No. 5.)

STATEMENT

Of the Receipts and Expenditures of the Baltimore & Ohio Rail Road, (Main Stem) from the 1st October, 1835, to the 30th September, 1836, embracing the amounts disbursed for transportation, and for the maintenance and repairs of the Railway, of Machinery, &c.

EXPENDITURES.	AMOUNT.	RECEIPTS.	AMOUNT.
Expenses of transportation, as per item No. 1, table 4.	$128,030 05	REVENUE, viz: From passengers, as per table, No. 1, . . .	$128,126 30
Repairs of Railway, as per item No. 2, table 4,	52,862 04	From tonnage, as per table No. 2, ...	153,186 23
Repairs of Machinery as per item No. 3, table 4,	26,871 40		
Office expenses, salaries, &c.	5,173 30		
Balance, ...	68,375 74		
	* $281,312 53		$281,312 53

*In the report of the President and Directors, and the accompanying statement of the Secretary, this amount is stated at $281,966 87. The difference arises from the fact, that the returns from the different agents, up to the 1st October, 1836, not having been then all received, an approximate estimate, as mentioned in a note to the Secretary's statement, was of necessity substituted in part.

(C. No. 6.)

STATEMENT

Of the aggregate Revenue received on the "Washington Branch" of the Baltimore and Ohio Rail Road, from the 1st *October,* 1835, *to the* 30th *September,* 1836, *inclusive, viz:*

Months.	FROM PASSENGERS.		FROM TONNAGE.		TOTAL.
	Passengers.	Amount.	Tons.	Amount.	
1835.					
October,	6,270	14,983 24		40 12	15,023 36
November,	4,518	10,580 63		73 14	10,653 77
December,	5,166	12,096 41		213 11	12,309 52
Jan. 1836.	4,631	10,874 49	58. 7.0.3	570 48	11,444 97
February,	3,850	9,018 25	245.19.0.0	646 91	9,665 16
March,	6,253	14,867 36	813. 2.0.1	1,507 12	16,374 48
April,	7,566	18,029 18	389. 0.1.0	1,200 85	19,230 03
May,	8,738	20,807 26	606.15.2.2	1,382 19	22,189 45
June,	7,233	17,239 14	798.18.2.3	1,374 77	18,613 91
July,	7,304	16,423 14	670. 1.3.3	1,224 93	17,648 07
August,	6,630	14,375 83	1027. 4.2.3	1,518 31	15,894 14
September,	7,257	16,854 14	1052.18.2.1	1,811 60	18,665 74
	75,416	$176,149 07	5662. 8.0.0	$11,563 53	$187,712 60

RECAPITULATION.

TRANSPORTATION,	75,416 Passengers.	REVENUE	$176,149 07
"	5,662.8.0.0 Tons.		11,563 53
Total, ...			$187,712 60

(C. No. 7.)

STATEMENT

Of the Expenses incurred in working the Washington Branch of the Baltimore and Ohio Rail Road, for the official year ending 30*th September*, 1836—*viz:*

Item 1*st. Expenses of Transportation*—Including the salaries of Depot agents, conductors, engine men, firemen and laborers—the cost of coal, &c., for the use of the locomotive engines and contingencies, - - - - - - - - - - - -	$ 18,590 23
Item 2*d. Repairs of Rail-way*—Including cost of materials for adjusting the track—the pay of supervisors and laborers—and the repairs of tools, and contingencies, - - - -	11,242 38
Item 3*d. Expenses of Machinery*—Including the repairs of wagons, coaches, locomotives and tenders, and contingencies, - - - - - - - - - - - -	11,557 63
	$ 41,390 24

(C. No. 8.)

STATEMENT

Of the Receipts and expenditures of the Washington Branch of the Baltimore and Ohio Rail Road, from the 1st October, 1835, to the 30th September, 1836: embracing the amounts disbursed for transportation, and for the repairs of the rail-way, machinery, &c.

EXPENDITURES.	AMOUNT.	RECEIPTS.	AMOUNT.
Expenses of transportation, as per item No. 1, table No. 7,	18,590 23	REVENUE, viz: From Passengers, as per table, No. 6.	176,149 07
Repairs of Railway, as per item No. 2, table No. 7, ...	11,242 38	From tonnage, as per table, No. 6.	11,563 53
Repairs of Machinery, as per item No. 3, table No. 7, . .	11,557 63		
Bonus to the State of Maryland, being *one fifth* of $176,149 07 receipts from passengers, ...	(*a*)35,229 81		
Baltimore and Ohio rail road's proportion of receipts from passengers, accruing from use of 8 miles of that road, ...	(*b*)27,292 86		
Baltimore and Ohio rail road's proportion of receipts from tonnage on the same,	3,057 41		
Office expenses, salaries, &c. . . .	3,847 19		
Interest, (annuity for Elkridge Landing Bridge,) . . .	1,000 00		
Balance, ...	75,895 09		
	$187,712 60		$187,712 60

(a) In the report of the President and Directors, and the accompanying statement of the Secretary, this amount is set down as $40,564 26. The difference proceeds from the fact, that the report and statement include the receipts of the months of July, August and September, 1835—while the above table is confined to the receipts from October 1st, 1835, to September 30th, 1836, both inclusive.

(b) In the report and statement mentioned in the above note, this is set down $29,942 69. The difference proceeds in like manner from including the receipts of July, August and September, 1835, in the calculation. In the said report and statement the tonnage was not included,

(C. No. 9.)

ABSTRACT OF TONNAGE

Transported Eastwardly on the Baltimore and Ohio Rail Road from the 1st October, 1835, to the 30th September, 1836, inclusive.

Months.	FLOUR.		TOBACCO.		Grain.	Meal, &c.	Provisions.	Live Stock.
	Barrels.	Weight.	Hhds.	Weight.				
October, 1835, ...	26,356	2541. 9.2.0	184	72. 5.3.2	298.12.0.2	297.18.3.1		40.11.0.0
November, ...	20,077	1935.12.3.3	84	31.19.3.2	276. 3.0.2	263. 0.3.0		11. 5.0.0
December, ...	19,049	1837. 9.2.1	15	5. 7.1.0	232.14.1.1	198. 0.2.2	143. 4.3.2	2.10.0.0
January, 1836.	12,606	1215. 7.1.3	14	5.10.3.2	197.13.3.2	138.15.1.1	102. 3.3.2	
February, ...	15,292	1476.10.3.3			167.17.2.1	157.16.0.0	22.14.0.2	
March, ...	24,551	2358.14.2.3	18	7. 4.2.0	394. 3.1.1	228. 1.2.3	9. 7.0.2	
April, ...	17,013	1642.10.1.2	65	23.17.3.3	231.10.3.2	247. 5.0.0	40. 5.3.2	
May, ...	18,038	1739. 5.2.1	279	103. 6.2.0	153. 4.1.3	320.15.2.0	28.11.2.3	
June, ...	5,305½	511.10.3.0	245	97.13.0.0	69.17.0.3	207.17.3.3	3.14.0.1	6.12.0.0
July, ...	6,369	623. 4.1.1	386	149.18.1.2	21.13.1.3	108. 9.3.0	2. 0.0.0	8.10.0.0
August, ...	5,638	543.13.1.0	568	215. 3.2.0	23. 9.3.2	84.15.2.1		
September, ...	4,348½	419. 6.0.3	519	200.15.0.1	281.10.3.0	96.12.0.3	1.10.0.0	2. 0.0.0
	174,643	16844.15.2.0	2377	913. 2.3.0	2348.10.3.2	2349. 9.0.2	353.11.2.2	71. 8.0.0

Abstract of Tonnage, &c. (continued.)

Months.	Whiskey.	Granite.	Soap Stone.	Lime.	Firewood.	Lumber.	Bark.	Ore & Ocre.	Iron.
October, 1835,	19. 6.3.1	872.19.0.0		122. 9.0.2	26. 9.0.0	50.15.3.3		15. 5.0.0	229.14.0.2
November, .	23. 7.1.2	593.11.0.0		25.14.0.2	55. 2.0.0	3. 0.0.0	1. 0.0.0	266. 8.0.0	287. 0.2.0
December, .	14.14.0.3	420.14.0.0		16. 1.2.0	130. 4.0.0				347.19.3.3
January, 1836.	8. 0.3.0	244.17.0.0		15.17.2.1	44.10.0.0		9. 8.0.0		226.17.0.2
February, .	12.17.1.1	25.14.0.0			108. 8.0.0		9. 3.0.0		163. 9.3.0
March, . .	25.14.2.1	550.11.0.0		58. 9.1.3	106. 5.0.0	22. 3.1.2	11.15.0.0		305. 8.2.3
April, . .	16. 6.3.2	720. 6.0.0		124.18.1.1	3.10.0.0	12. 0.0.0	2. 5.0.0	44. 7.0.0	294. 4.2.1
May, . . .	45. 6.1.0	876.11.0.0		205. 2.1.3	4.10.0.0	8.15.0.0	12. 3.0.0	37.18.0.0	500. 0.0.2
June, . .	24.19.2.1	783.12.3.0	9. 0.0.0	101. 5.0.3		34.12.0.0	13.17.0.0	129.17.2.0	287.12.3.2
July, . . .	9.18.0.3	862. 1.0.0		149. 3.2.3	4. 8.0.0	79.18.3.0	12.13.2.0	40. 0.0.0	380.12.0.0
August, . .	18. 7.0.2	1086. 0.0.0	4.13.0.0	122. 4.3.1	3. 5.0.0	163. 2.0.0	31. 1.0.0	103.18.0.1	467. 7.0.2
September, .	25. 2.1.0	1103. 4.1.0	5.18.0.0	167.17.0.2	24. 7.0.0	52. 8.0.0	31.13.0.0	204.14.0.0	305. 4.0.3
	244. 1.1.0	8140. 1.0.0	19.11.0.0	1109. 3.1.1	510.18.0.0	426.15.0.1	134.18.2.0	842. 7.2.1	3795.11.0.0

Abstract of Tonnage, &c. continued.

Months.	Wool.	Leather.	Paper.	Miscellaneous	Total.
October, 1835,	0. 8.0.0	27. 6.3.3	3. 6.3.0	218. 1.3.3	4836.19.3.3
November, .	0. 8.2.0	38.10.2.3	1.12.1.3	263. 3.1.3	4076.19.3.0
December, .		28. 0.0.3	0.11.0.0	165. 3.0.2	3542.14.2.1
January, 1836,		11.12.2.2	1. 1.2.0	143.12.0.1	2365. 8.0.0
February, .		12.14.3.3	6.19.3.0	132.19.3.1	2297. 5.0.3
March, . .		36. 0.3.3	3. 5.0.0	129. 8.3.0	4246.13.0.1
April, . .		52.18.3.2	5.13.0.0	250. 9.2.0	3712. 9.0.3
May, . . .	0.10.2.0	40.19.2.2	1. 7.2.2	210. 8.3.3	4288.16.0.3
June, . .	1.15.2.0	14.15.2.1		266. 8.0.2	2565. 1.0.0
July, . . .	2.13.0.1	20. 3.1.1	9.12.1.0	214. 7.3.2	2699. 7.2.0
August, . .	3. 7.0.2	17. 4.3.2	3. 3.0.0	176. 9.3.0	3067. 5.0.1
September, .	6.13.1.3	27. 9.0.1	1. 3.0.0	148.16.3.2	3106. 4.1.2
	15.16.0.2	327.17.2.2	37.15.1.1	2319.10.0.3	40805. 3.3.1

RECAPITULATION.

Commodities.	Weight.
Flour, - - - Tons.	16844.15.2.0
Tobacco, - - -	913. 2.3.0
Grain, - - - -	2348.10.3.2
Meal, - - - -	2349. 9.0.2
Provisions, - - -	353.11.2.2
Live stock, - - -	71. 8.0.0
Whiskey, - - - -	244. 1.1.0
Granite, - - -	8140. 1.0.0
Soap Stone, - - -	19.11.0.0
Lime and Lime Stone, -	1109. 3.1.1
Firewood, - - - -	510.18.0.0
Lumber, - - -	426.15.0.1
Bark, - - - -	134.18.2.0
Ore, &c. - - -	842. 7.2.1
Iron, - - - -	3795.11.0.0
Wool, - - - -	15.16.0.2
Leather, - - -	327.17.2.2
Paper, - - - -	37.15.1.1
Miscellaneous, - -	2319.10.0.3
Total, - -	40805. 3.3.1

OFFICE OF THE TREASURER OF THE BALTIMORE AND OHIO RAIL ROAD COMPANY, 1*st October*, 1836.

JOSEPH W. PATTERSON, Esqr., *President.*

Sir,—I respectfully submit my accounts for the last year.

Your ob't serv't,

W. H. MURRAY, *Treas'r.*

The Baltimore and Ohio Rail Road Company, for the year commencing 1*st October*, 1835, *and ending* 30*th September*, 1836, *in account with Wm. H. Murray, Treasurer.*

To Cash paid.

For dividend in October, 1835,	$45,001 87
" Construction, including graduation, laying rails, masonry and materials,	82,367 52
" Improvements at Depots, real estate, buildings, rail tracks, turn-outs, sidelings and water stations,	19,084 98
" Right of way and damages,	6,074 16
" Burden and passenger cars,	46,078 07
" Locomotive Engines,	13,919 75
" Repairs of road, and of machinery and cars,	77,114 23
" Surveys—Engineer Department,	18,396 15
" Anticipated instalments on three shares of stock refunded to E. Strahn,	75 00
" Incidentals and contingent expenses, printing, engraving, office expenses, and salaries, taxes, &c. &c.	5,861 25
" Interest on million loan, and on anticipated instalments of State and City, &c.	79,198 25
" Expenses of transportation,	127,954 85
" Law expenses,	2,061 91
" Accounts of disbursing officers, including unsettled balances,	1,232 34
	$524,420 33

CR.

By balance of funds in hand per last report,	$46,237 14
" amount received for revenue for the year ending 30th September,	282,016 83
" " Burden cars sold to the Washington Branch road,	11,620 00
" " Loan at Mechanics' Bank,	100,000 00
" " " Union Bank,	20,000 00
" " Sales of horses,	6,972 27
Balance,	57,574 09
	$524,420 33

The Baltimore and Ohio Rail Road Company, (Washington Branch) in account with Wm. H. Murray, Treasurer.

To Cash paid.

For Construction, including laying rails and materials,	$51,802 53
" Locomotive steam power,	20,351 94
" Burden cars,	11,877 63
" Passenger cars,	2,725 85
" Right of way and damages,	3,459 00
" Real estate and construction of depots,	27,177 75
" Repairs of the road and of the machinery, passenger and burden cars,	9,461 19
" Law expenses,	407 71
" Interest,	757 22
" Surveys, Engineer Department,	1,535 00
" Bonus to the State, one-fifth of the receipts for passengers,	31,033 66
" Expenses of transportation,	18,590 23
" Expenses incurred in quelling the riot on the road in 1834,	1,629 05
" Contingent and incidental expenses, including office expenses, salaries, taxes, printing, &c.	4,992 77
" Accounts of disbursing officers, including unsettled balances,	2,476 51
" Balance of funds in hand,	13,886 32
	$202,164 36

CR.

By balance per last report,	$50,520 33
" Amount of revenue received,	151,644 03
	$202,164 36

The Company have acquired since the last Annual Report, in addition to the Real Estate heretofore reported, the following pieces of property, viz.

1st. A lot situated on the south side of the Potomac river, near to its confluence with the Shenandoah at Harper's Ferry, extending from the Company's viaduct over the Potomac along the line of the rail way southwardly, until it intersects the main street of that village, thence westwardly along said street, to the old bridge across the Potomac, thence northwardly to the river, and thence down the same to the viaduct.

This scite will afford a most valuable and important location for the purposes of the Company, directly at the point of its connexion with the Winchester and Potomac rail road, the deed for which is placed for record in Jefferson county, Va.

2d. A lot in the city of Washington, adjoining the depot of the Company there, and extending back along Second street to its intersection with B street north. This lot secures to the company a convenient and direct communication with its property on square No. 574, where it is proposed to establish accommodations and shops for ten Locomotive Engines and other machinery of the company. The deed for this property is lodged for record in Washington County, District of Columbia.

AGREEMENTS.

Agreement with the Chesapeake and Ohio Canal Company, in relation to the slopes of the river walls and the bridges of the Canal.

Whereas, by a Resolution passed at a general meeting of the stockholders of the Baltimore and Ohio Rail Road Company, on the 23d day of July last, the opinion of the said stockholders was expressed, that the Chesapeake and Ohio Canal Company (notwithstanding their acceptance of the Act of Assembly of Maryland, passed at extra session of May, 1836, entitled, "An Act for the promotion of Internal Improvement,") should have and exercise the right and privilege of determining, by their engineers, and to that determination conforming in the construction of their work the proper slope or angle of the river wall of their canal being such slope as that company has adopted at other points on their canal for its security, at all places where the canal and rail road might come in contact in the course of the joint construction contemplated by the said act, so however, that said slope as so determined, should not prevent, retard or interfere with the location of the rail road, as the same may be determined by the commissioners mentioned in the third section of the act aforesaid ;—and further, that whenever it may be necessary, as provided for by the third section of said act, for the Baltimore and Ohio Rail Road to cross the Canal, if the crossing be by permanent bridges, they should be erected at the elevation of at least seventeen feet above the water line of the canal, or of as great an elevation as that of the bridge now about to be constructed over the canal at Harper's Ferry, and that, where the elevation of the rail road above the canal might not admit of such a height for the bridge, they should be made to work upon a pivot or with a draw, so as to create no difficulty in navigating the canal—*And whereas*, the said President and Directors are fully authorised and empowered, by the proceedings of the meeting of stockholders, aforesaid, to stipulate and agree to and with the Chesapeake and Ohio Canal Company, according to the tenor of the above expressed opinion ; and deeming it proper that such stipulation and agreement should be made—Now therefore, this agreement and instrument of writing witnesses, that for and in consideration of the premises, and in pursuance of the authority aforesaid, the President and Directors of the Baltimore and

Ohio Rail Road Company, do hereby stipulate and agree with the Chesapeake and Ohio Canal Company. That the Chesapeake and Ohio Canal Company (notwithstanding the acceptance of the act aforesaid) shall and may have and exercise the right and privilege of determining by their engineers, and to that determination conforming in the construction of their work, the proper slope or angle of the river wall of their canal, being such slope as that company has adopted at other points on their canal for its security at all places where the canal and rail road may come in contact in the course of the joint construction contemplated by said act, so, however, that said slope, as so determined, shall not prevent, retard, or interfere with the location of the rail road, as the same may be determined by the commissioners mentioned in the third section of the act aforesaid; and further the said President and Directors do also stipulate and agree with the said Chesapeake and Ohio Canal Company, that whenever it may be necessary, as provided for by the said third section, for the said rail road to cross the said canal, if the crossing be by permanent bridges they shall be erected at the elevation of at least seventeen feet above the water line of the canal, or at as great an elevation as that of the bridge now about to be constructed over the canal at Harper's Ferry ; and that when the elevation of the rail road above the canal may not admit of such a height for the bridges, they shall be made to work upon a pivot, or with a draw, so as to create no difficulty in navigating the canal.

In testimony whereof, the president of the said company, in virtue of a resolution of the President and Directors of said rail road company, passed on the sixth of September, 1836, to that effect, has hereto set his hand and caused the seal of the Baltimore and Ohio Rail Road Company to be affixed hereto this 17th day of September, in the year eighteen hundred and thirty-six.

(Signed) WM. STEUART,
President pro tem.

Guarantee of six per cent. to the State of Maryland on the subscription authorized at the extra session of May, 1836.

Whereas, at a general meeting of the stockholders of the Baltimore and Ohio Rail Road Company, held at the office in the city of Baltimore, on Monday, the 18th day of July last, 1836, in pursuance of public notice tothat effect,

given on the fifteenth day of June, 1836, the following resolutions were adopted:

Resolved, That the stockholders of the Baltimore and Ohio Rail Road Company in general meeting assembled, do hereby stipulate, agree, and bind the said company to guarantee to the State of Maryland (after the expiration of three years from the payment by the State of each of the instalments on the stock authorised to be subscribed on its part to the stock of this company, by an act passed by the legislature of Maryland, at the extra session of May, 1836, entitled, "An Act for the promotion of Internal Improvement," should such subscription be made,) the payments from that time out of the profits of the work, of six per centum per annum, payable semi-annually, on the amount of money which shall be paid to this company under and by virtue of this act, until the clear net annual profits of the Baltimore and Ohio Rail Road shall be more than sufficient to discharge the interest which this company shall be so liable to pay to the State of Maryland, and shall be adequate to a dividend of six per cent. per annum among its stockholders, and thereafter the State shall in reference to the stock so subscribed for, and on so much thereof as the State may hold, be entitled to have and receive a perpetual dividend of six per centum per annum out of the profits of the work as declared from time to time, and no more; and all and so much of such annual profits as shall exceed six per centum per annum, shall be distributed to the other stockholders according to their several interests in the said company. It being the intention of the meeting, in the passage of the resolution, to comply fully with the requisions of the 9th section of the act aforesaid, touching the guarantee of the interest as therein mentioned.

Resolved, That the president be directed to cause to be prepared a proper instrument of writing, binding the company in the terms of the foregoing resolution, and to sign the same and to affix the corporate seal of this company thereto, and to lodge the same with the treasurer of the western shore of Maryland.—Now, THEREFORE, THIS INSTRUMENT OF WRITING WITNESSETH, that the said Baltimore and Ohio Rail Road Company does hereby stipulate, agree, and bind itself to the State of Maryland in the manner and form and for the purposes set forth in the first of the foregoing resolutions, and in compliance with the conditions contained in the 9th section of an act of the General assembly of Maryland, passed at the extra session of May, eighteen hun-

dred and thirty-six, entitled, "An Act for the promotion of Internal improvement."

In testimony whereof, and in pursuance of the requisitions of the second of the foregoing resolutions, the president of the said company hath hereto set his signature and caused the corporate seal of the said company to be affixed.

(Signed,) J. W. PATTERSON,
President pro tem.